History of the Proceedings

of the

National Academy of Sciences

of the United States of America

1914-1963

History of the Proceedings of the National Academy of Sciences 1914–1963

by

EDWIN BIDWELL WILSON

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EDWIN BIDWELL WILSON

April 25, 1879–December 28, 1964

Managing Editor of the Proceedings, 1915–1964

FOREWORD

January 1965 marks the fiftieth anniversary of the publication of the *Proceedings of the National Academy of Sciences*. And January 1965 marks the fiftieth anniversary of the services of Edwin Bidwell Wilson as managing editor of these *Proceedings*. His service in this office has not only been uniquely long, it has been exceptionally effective. At this time, it is fitting and proper that the undersigned officers, past and present, of the Academy and of its Editorial Board record here their appreciation of the intelligent, wise, and selfless service rendered to the *Proceedings* by their long-time friend and colleague, Dr. Edwin B. Wilson.

Wilson started his career as a student of Josiah Willard Gibbs at Yale University; his studies there are documented by the pervasive influence of the Gibbs-Wilson book on Vector Analysis (1901). Wilson's Advanced Calculus (1912) was a meaty book from which many American mathematicians (in particular the present chairman of the editorial board) first learned about mathematical rigor and mathematical vigor.

In 1914 when Dr. Wilson was asked to be the first managing editor of the Academy's embryonic journal, he was a Professor of Mathematics at M.I.T. and was not himself a member of the Academy, though his abilities were well known to leading members of the Academy such as George Ellery Hale and A. A. Noyes. In 1919 Dr. Wilson was himself elected to membership in the Academy, where he joined the section of Physics. At that time he was Professor of Mathematical Physics and head of the Department of Physics at M.I.T. In the period 1920–22, he was one of the three members of an administrative committee in charge of the Institute while a new president was being selected. In 1922 he became Professor of Vital Statistics in the Harvard School of Public Health. His scientific interests continued to range widely over many fields, including also statistics, astronomy, and mathematical economics. After his retirement from Harvard, he served as a consultant to the Office of Naval Research in Boston, a capacity in which he is still active. His scientific accomplishments have been honored, most recently (1964) by the Secretary of the Navy's presentation of the Navy Distinguished Civilian Service Award—the highest award granted by the Navy to a civilian.

For members of the Academy, the *Proceedings* provides an effective means for the rapid publication of first announcements of scientific discoveries. The scope of Dr. Wilson's scientific investigations is reflected by his own

publications in the *Proceedings*. His 68 articles listed in the 50-volume index include pure mathematics ("A general theory of surfaces," with C. L. E. Moore in 1916), physics ("Coulomb's law and the hydrogen spectrum" in 1924), astronomy (four papers on "A statistical discussion of sets of precise astronomical measurements," with W. J. Luyten in 1924), the history of science ("The Elder Peirce's" in 1926 and "Willard Gibbs on soaring flight" in 1945), statistics ("On confidence intervals" in 1942 and "Significance levels for a skew distribution" in 1953), and epidemiology ("Progressive immunization," with J. Worcester in 1941, "The law of mass action in epidemiology," with J. Worcester in 1945, and "Note on the epidemiology of peptic ulcers" in 1962). His activity continues, most recently with two papers on "Comparative experiment and observed association" in volume 51 (1964).

Dr. Wilson's editorial services to these *Proceedings* began with the by no means easy task of getting this fledgling journal off to a sound start, both financially and scientifically. Over the fifty-year period of his service as managing editor, the problems have changed in detail and policies have altered, but Dr. Wilson's interest in the *Proceedings* as a means of effective communication of new scientific ideas has never flagged. The nature and variety of the problems met by a managing editor can be read in and between the lines of his *History of the Proceedings*. This History was prepared by Dr. Wilson in response to a request from the Editorial Board of the *Proceedings*, made with the endorsement of the Council of the Academy. It is a pleasure to present in this volume this first-hand record of the first fifty years of this journal.

Within the Academy, Dr. Wilson's activities have not been confined to the *Proceedings*. From 1929 to 1954 he was chairman of the Committee on Revision of the Constitution. From 1929 to 1938 he was a member of the Committee on "Government Relations and Science." He served as chairman of the section of Physics, 1930–1933, as Vice President of the Academy, 1949–1953, and as a member of its Council, 1953–1956. On at least four occasions he has been a member or chairman of the annual nominating committee for officers of the Academy. His expert knowledge of the constitution of the Academy, his independent views, and his pithy wisdom have been in effective evidence at many business meetings of the Academy. Successive Presidents of the Academy have welcomed his advice.

Through all the variety of his own activities and scientific work, his loyal service to the *Proceedings* has remained a steady center of his interests. His attention remains turned to the future and to the well-being of the Academy and its *Proceedings* in reflecting the best in American science.

For these exceptional services to the Academy and its *Proceedings*, we salute Dr. Wilson on this occasion, his fiftieth anniversary as Managing Editor.

FREDERICK M. SEITZ
President of the Academy,
1962–

DETLEV W. BRONK
President of the Academy,
1950–1962

A. N. RICHARDS
President of the Academy,
1947–1950

L. V. BERKNER
Treasurer

SAUNDERS MAC LANE
Chairman of the Editorial Board,
1960–

WENDELL M. STANLEY
Chairman of the Editorial Board,
1955–1960

LINUS PAULING
Chairman of the Editorial Board,
1950–1955

HUGH DRYDEN
Home Secretary

Just as this volume was nearing completion came the sad news of Dr. Wilson's sudden death on Monday, December 28, 1964. He will be greatly missed in many capacities, and not least in the management of these *Proceedings*. We deeply regret that he was not able to witness the publication of this volume.

History of the Proceedings of the National Academy of Sciences

CHAPTER I. THE FIRST SIX VOLUMES

In its early years, the Academy had a Proceedings of which only one volume was published, as follows: in 1877, Pt. I, pp. 1–119; in 1884, Pt. II, pp. 122–239; and in 1895, Pt. III, pp. 243–406. The Academy was in the doldrums in the latter part of the 19th century. Its original limitation of 50 members was removed by amendment to its charter in 1870 and the number elected in 1872 was 23. From that year there was an increase until in 1879 there were 101 members, a number which was fairly well retained for a decade and equaled in 1890 but then dropped off to 82 in 1898 in which year there were no elections. The number which might be elected each year had been limited to 5 but that would have been sufficient to maintain the membership or even increase it. This was changed to 10 effective in the election of 1908 and again to 15 effective for that of 1917. The Academy had shaken off its lethargy.

This and a trifle more of the background to the initiation of the Proceedings as a monthly journal must be borne in mind. In 1902, George E. Hale was elected to membership at the age of 33. In 1905, Arthur A. Noyes was elected at the age of 38. They had long been friends. In 1908, E. G. Conklin was elected at the age of 42, and in 1911 A. L. Day at the age of 41. George Hale was elected Foreign Secretary in 1910. He was not only a famous astronomer in the newer astrophysical lines but a charming gentleman with a vision for the future of this Academy and determined to do his part in bringing that vision to pass. He prepared a series of papers on the relation of national academies to the progress of research of which number III was "The Future of the National Academy of Sciences," which was published in *Science* (vol. 40, pp. 907–919 (1914)), in the course of which he advocated the establishment of a journal to be called The Proceedings for the prompt publication of brief first announcements of discoveries and of the more important contributions to research of members and of those nonmembers whose work appeared to some member to be of particular importance.

Accordingly, at the Annual Meeting of 1913 (the Semi-Centennial Meeting) the Academy voted that the President appoint a committee to report on the proposal. The report at the Autumn Meeting of 1913 was as follows (Ann. Rep. 1913, pp. 25–27)*:

REPORT OF THE SPECIAL COMMITTEE ON THE PUBLICATION OF A JOURNAL BY THE ACADEMY.

The special committee appointed to report on the advisability of the publication by the Academy of some form of journal respectfully submits the following report:

* This abbreviated style of reference is used for all citations to the *Annual Report of the National Academy of Sciences.*

The committee, believing that the question of the publication of a journal can be satisfactorily considered only after a fairly definite plan has been formulated, has taken up in some detail the more important aspects of the matter; and it presents in the following paragraphs the information it has gathered and the provisional conclusions it has reached.

Name of the journal.—The appropriate name would seem to be "Proceedings of the National Academy of Sciences," since the publication of "Proceedings" is provided for in the constitution of the academy, and since the journals of nearly all academies are called proceedings.

Character of the journal.—The journal or proceedings might well consist mainly of original publications of the researches of members of the Academy and of other American investigators whose work is presented by a member and approved for publication by the editors of the "Proceedings." The committee believes that as a rule the papers should not consist, as do many of those published in the Comptes Rendus of the French Academy, of conclusions presented in condensed form without experimental evidence, nor of preliminary notices published merely for securing priority or reserving the field; but that, on the other hand, the papers should not be so long nor so detailed as those appropriately published in journals devoted to the special branches of science. The papers should always be precise, and should contain some record of the experimental or observational results wherever required for the substantiation of important conclusions; but these results should be given in condensed summaries, reserving long tables of data and other minutiae of the work for subsequent publication in special journals. Such subsequent publication should be permitted and encouraged. Plates and elaborate illustrations should not be provided for, but zinc etchings and halftones might be included when essential.

Plan of publication.—It would seem best to issue the proceedings monthly, and to provide at the start for the publication of about 1,000 pages a year. The committee believes that the proceedings should be in charge of an editor, who would be assisted by a committee or editorial board consisting of one or more members belonging to each of the committees into which the academy is divided, and who would be relieved of routine editorial work by the employment of an assistant secretary.

Cost of publication.—Information that the committee has received in regard to the publication of a similar journal indicates that the cost of printing and distributing 1,000 to 1,500 copies of the proceedings, not including any payment for editing and managing, would not exceed $4 a page, or $4,000 a year if the proceedings should consist of 1,000 pages.

Means of financing the publication.—The income of the Academy for the year 1912 from its funds available for general purposes and from membership dues was $3,423, and the general expenses of the academy for that year were $2,041, leaving a balance of $1,382 available for other purposes, such as the publication of a journal.

It has been suggested that certain of the research funds of the Academy are also available for the publication of researches in the fields to which the funds pertain, and the committee believes that it would be appropriate to invite the trustees of the various research funds administered by the Academy to consider the allotment of a portion of the income for the publication of the researches supported from these funds, and of such other researches as the members of the Academy may desire to publish therein.

Since the general funds of the academy are inadequate, some further provision for the expense of publication of the proceedings will have to be made. It is the opinion of a majority of the committee that an effort should first be made to secure the passage by Congress of an act providing for the printing of the proceedings by the Government, in addition to the printing of the annual report and the scientific memoirs of the Academy already authorized by an existing act of Congress.

If it should prove impracticable to secure the passage of such an act by Congress, another alternative is to raise by subscription a guarantee fund of $1,500 to $2,000 a year for a period

of five years to supplement the funds of the Academy available for the publication of the proceedings. A provisional offer of $1,000 per year for this purpose has already been received by the committee. At some later date the Joseph Henry fund, the income from which is likely to be about $2,000, will be available for the same purpose. An increase in the annual dues of the academy from $5 to $10, yielding about $650 more, might also receive consideration as a means of meeting a part of the cost of publication.

Distribution of the proceedings.—The proceedings might well be sent free to members of the academy, to the libraries of all the prominent academies, to certain other important libraries, and to editors of the leading abstract journals in various branches of science. The privilege of subscribing to the proceedings should be open to any person or institution. Especial efforts should be made, under the direction of the foreign secretary, to secure an adequate foreign distribution of the proceedings, so as to bring American work more fully to the attention of foreign scientists.

Public announcements of researches presented to the Academy.—Abstracts of many of the papers presented to and accepted by the Academy might well be prepared and published in Science immediately after the acceptance of the papers or simultaneously with their appearance in the monthly numbers of the proceedings. Abstracts of such papers as can be made of popular interest might also be issued to the Associated Press on the day on which the monthly number appears.

Advantage of the publication of proceedings.—The most important of the advantages to be derived from the publication of the proceedings is the service it would render to American science. It would create a journal of national scope and standing which might well furnish a fairly complete record of the important contributions to all branches of science made by American investigators. It would thereby serve to make American research more promptly and more fully known to the scientific men of other nations, and it would bring to the attention of the scientific men of this country the important work done in other fields than their own.

The advantages that would come to the Academy itself from the publication of a suitable journal are of secondary, but by no means of inconsiderable importance, for the fuller development of the Academy as the national organization representing American research ought to contribute in large measure to the advancement of American science. Some of the advantages that would result to the Academy from rendering this new service would seem to be a fuller recognition of the importance of the Academy by scientific men and public men at home and abroad, the establishment of closer relations between members of the academy by making known to them the work of their associates, and the securing by exchange of many valuable publications whereby an academy library might be developed.

Recommendations.—In view of the foregoing considerations, the committee recommends that the academy adopt a resolution favoring the publication of proceedings of the general character set forth in this report; and, if this be approved by the Academy, the committee further recommends that the matter be referred to the council with power to arrange for the publication of proceedings as soon as adequate means of financing the publication shall have been secured.

A. A. Noyes, G. E. Hale,
E. G. Conklin, C. S. Minot,
Arthur L. Day, R. S. Woodward.

The Academy adopted the report and referred it to the Council with power to act. The Council appointed a new Committee on the Publication

of the Proceedings whose recommendations were adopted by the Council in 1914, as follows (Ann. Rep. 1914, p. 21):

That the first number of the proceedings be issued on January 1, 1915, and that one number be issued on the first of each following month, the number of pages in each number to be varied within reasonable limits with the amount of material available; also that the place of publication be the office of the home secretary, Washington, D. C.

That the publication of the proceedings be conducted by the council through a board of editors to be appointed by the council; that this board consist of a chairman, a managing editor (who need not be a member of the academy), of the home secretary and the foreign secretary ex officiis, and of a staff of associate editors representing all the more important branches of research related to the work of the academy; that the chairman be primarily responsible for the preparation of the journal, and that the home secretary be primarily responsible for its distribution, cooperating with the foreign secretary with respect to the presentation and exchange of copies in foreign countries; that it be the duty of the chairman to submit to the council at the autumn meeting of each year a report on the condition of the proceedings, a budget of prospective receipts and expenditures for the ensuing calendar year, and recommendations as to changes in the staff of associate editors and as to other matters relating to the proceedings; that it be the duty of the managing editor to refer any paper presented for publication in the proceedings to one of the associate editors for his opinion as to the acceptance, rejection, or modification of the paper. In case of agreement between the managing editor and associate editor, the action agreed upon shall be taken; in the case of doubt or disagreement, the paper shall be referred to at least two other members of the academy; that it be the duty of each associate editor to secure for the proceedings, as far as possible, papers describing, in suitable form, the best American work done in the field of research which he represents, and that it be his further duty to advise the managing editor in regard to the acceptance or modification of the papers offered for publication in his field; that a meeting of the board of editors be held at each annual meeting of the academy for the discussion of the general policies to be followed in maintaining and developing the proceedings.

That the proceedings be of the general character described in the report of the former committee on proceedings, presented to the academy on November 18, 1913. In the opinion of the committee the main function of the proceedings should be to present in the form of brief, original articles a comprehensive survey of the more important contributions to scientific research currently made by American investigators. The articles should be much shorter and less detailed than those published in special journals. The articles might well, as a rule, vary from 2 to 6 pages in length, with maximum limit in exceptional cases of 10 to 12 pages.

The committee recommends that the proceedings be similar in make-up to the proceedings of the Royal Society, with a printed page about $4^3/_4$ by $7^3/_8$ inches and a paper page 7 by 10 inches.

The Editorial Board of the Proceedings was appointed to consist of

ARTHUR A. NOYES, Chairman — EDWIN B. WILSON, Managing Editor
ARTHUR L. DAY, Home Secretary — GEORGE E. HALE, Foreign Secretary

J. J. Abel	Henry Crew	R. G. Harrison
W. B. Cannon	C. B. Davenport	W. H. Holmes
J. McK. Cattell	Simon Flexner	J. F. Kemp
E. G. Conklin	E. B. Frost	E. H. Moore
J. M. Coulter	Moses Gomberg	Charles Schuchert

The first issue (actually dated January 15, 1915, instead of January 1) carried the following Announcement which was part of the exhibit of the Proceedings at the Centennial, for as a policy to strive toward it has never been formally abrogated by the Academy or the Council.

ANNOUNCEMENT

The National Academy of Sciences begins with this issue the publication of monthly Proceedings.

The Proceedings, as the official organ of publication of the Academy, will contain reports of its business and scientific sessions and of actions taken by its Council, notices of the Scientific and Biographical Memoirs printed for the Academy by the United States government, announcements of the awards of medals and research grants made from its trust-funds, and statements as to other activities of the Academy.

The Proceedings will also serve as a medium for the prompt publication of brief original papers by members of the Academy and other American investigators. Its aim will be to furnish a comprehensive survey of the more important results of the scientific research of this country. With this end in view the papers will, in general, be much shorter and less detailed than those published in journals devoted to special branches of science. It is indeed intended that publication in the Proceedings shall supplement, not replace, that in special journals. The Proceedings will aim especially to secure promptness of publication, wide circulation of the results of American research among foreign investigators, and fuller recognition of the advances made in the separate sciences by persons more directly interested in other sciences. The Proceedings will thus serve to draw wider attention to the detailed publications appearing in the special journals.

The scientific papers appearing in the Proceedings, though necessarily brief, are expected to be precise and to contain some record of the experimental or observational results upon which the conclusions are based; but such results are to be given in condensed summaries, reserving long tables of data, elaborate illustrations, and technical details of the work for publication in special journals. When practicable, the papers are to include an introductory statement of the general aspects of the research and of its relation to previous knowledge in the same field, so that its significance may be appreciated by those engaged in other branches of science.

The reports of the first Chairman on the first four numbers and on the succeeding twelve were as follows (Ann. Rep. 1915, p. 20; and 1916, p. 21):

REPORT OF THE EDITORIAL BOARD OF THE PROCEEDINGS.

The editorial board of the Proceedings reports to the academy that four numbers of the Proceedings have now been issued, containing 67 original papers in addition to the report of the autumn meeting, notices of scientific memoirs, and announcements. These numbers have consisted of 258 pages, an average of 64 pages per number and of about 4 pages per article. The papers are distributed among different sciences as follows: Mathematics, 11; astronomy, 11; physics, none; chemistry, 11; geology, 2; paleontology, 1; botany, 4; zoology (including genetics), 12; physiology, 8; pathology, none; anthropology, 5; psychology, 2. It will be noticed that the subjects of physics, of geology and paleontology, and

of pathology have been very inadequately represented; and the editorial board urges members of the academy in these fields to endeavor to remedy this situation.

An edition of 3,000 copies of these four numbers has been printed. Of this edition about 900 are to be sent abroad to the libraries of universities and other active research institutions upon a mailing list prepared with great care by the foreign secretary, aided by members of the editorial board. Of this edition 1,200 copies have also been distributed in this country by the home secretary to important libraries and to the thousand persons whose names are starred in Cattell's American Men of Science.

ARTHUR A. NOYES, *Chairman.*

REPORT OF THE BOARD OF EDITORS OF THE PROCEEDINGS.

The board of editors of the Proceedings reports to the academy that the 12 numbers of the Proceedings issued since its last annual report contain 157 original papers, the report of the annual and autumn meetings, notices of scientific memoirs, and the report of the Panama Canal committee. These numbers consist of 641 pages, an average of 53 pages per number and of about 4 pages per article. The papers are distributed among different sciences as follows: Mathematics, 17; astronomy, 37; physics, 11; chemistry, 12; geology, paleontology, and mineralogy, 16; botany, 3; zoology, 13; genetics, 17; physiology, pathology, bacteriology, and biochemistry, 16; anthropology, 13; psychology, 2.

The universities or research laboratories that have contributed three or more papers are as follows: Carnegie Institution, 32 (divided as follows: Mount Wilson Solar Observatory, 22; nutrition laboratory, 4; marine biology, 3; terrestrial magnetism, 1; botanical research, 1; geophysical laboratory, 1); University of California, 17; Harvard University, 16; Johns Hopkins University, 14; University of Chicago, 13; Yale University, 7; Rockefeller Institute, 7; Princeton University, 6; United States Geological Survey, 5; United States National Museum, 5; Station for Experimental Evolution, 4; University of Illinois, 3; American Museum of Natural History, 3.

The edition of the Proceedings was reduced from 3,000 to 2,200 copies with the issue of May, 1915, and it is to be further reduced to 1,700 copies with the issue of May, 1916, as the distribution of free copies in America is to be now entirely discontinued. At present about 900 copies are mailed to foreign exchanges and about 250 copies to members of the academy and other American subscribers.

The total expense incurred in connection with the Proceedings during the year 1915, representing approximately the cost of publication of the first volume, is shown by the report of the treasurer to be $4,300.67. Of this sum $2,977.37 was expended for printing and distributing, corresponding to a cost of $4.65 per page.

The board recommends that action be taken by the academy informing members and others presenting accounts of new researches at the academy meetings that they are expected to furnish to the home secretary at the time of the meeting a brief paper describing these researches in form suitable for publication in the Proceedings. The board also suggests that in order to secure fuller circulation of the Proceedings in our universities, colleges, and research laboratories, members of the academy be requested to see that their own institutions subscribe to the Proceedings in case they have not already done so.

ARTHUR A. NOYES,
Chairman.

The report was accepted and the following minute adopted:

That members and others presenting accounts of their researches at meetings of the academy be expected to furnish the home secretary at the time of the meeting with a written description of such researches in form suitable for publication in the Proceedings.

As Dr. Noyes had gone from Massachusetts Institute of Technology to the California Institute of Technology, it fell upon me to write the report on the first three volumes (Ann. Rep. 1917, pp. 22–23):

REPORT OF THE EDITORIAL BOARD.

As we have now completed the third volume of our Proceedings it seems to me opportune to circulate some statistics relative to the Proceedings and covering its whole existence. You will notice in the summary of articles according to subjects that mathematics and astronomy have recently dropped off a little, although their totals remain satisfactory. Physics has come to a satisfactory total, mainly by the large number of articles last year. Chemistry, considering the amount of chemical work in this country relative to work in other lines, has not a satisfactory total, nor has the number of articles been satisfactory in either of the last two years. Two of the articles in 1915 in chemistry might have been called agriculture. It has seemed best to introduce agriculture as a special topic, although it is clear that the make-up of the academy is such that we can hardly expect a very large number of articles in agriculture, except on general grounds. Geology, though having a bad start, has satisfactory totals, and the same is true of zoology and genetics. Botany, however, has always been low, perhaps because of a relatively smaller output in botany in this country. Physiology and pathology seem to me hardly satisfactory in their totals, pathology in particular having very few articles in comparison with the great activity in that subject in this country. Anthropology has perhaps been particularly hard hit by the war, and psychology has always been small in the Proceedings, possibly because there is not a proportionate degree of activity in scientific psychology in this country.

I should be glad if this summary may be of some help to the editors in pointing out those branches in which special effort should be made to have the Proceedings properly representative of American research. The war period is one in which research will probably suffer seriously, and for that reason is a period in which more than ordinary discrimination and effort must be used to keep the Proceedings up to standard and truly representative. The action of this board in voting that the size of the Proceedings should not be materially diminished is an indication that the board feels that particularly during the war period the Proceedings should be kept up. Indeed, if the Proceedings is carefully and conscientiously maintained in standard and size during the period of the war, it would almost seem as though no efforts after the war would be necessary other than those of eliminating superabundant material and thus automatically raising the standard.

You will see from the summary of institutions which have contributed more than three articles that there has been a great diminution in receipts from the University of Chicago, University of California, Johns Hopkins University, and the Rockefeller Institute. As the number of articles has not varied greatly from year to year, this diminution has been made up in the main by straggling articles from all sorts of places. The Proceedings certainly should welcome this increase in the distribution of its articles. It shows for one thing that the Proceedings is becoming representative of American research. It does seem, however, as though the number of articles received from the University of Chicago, University of California (including the Lick Observatory), and from the Rockefeller Institute are disproportionately small this year, and it may be feared that unless these leading institutions do better in the future we must infer that while the Proceedings is growing in representative character the country over, it is losing sadly in obtaining the best work of the best men in the best institutions and is thus in one way becoming far less representative than it should be.

The statistics of articles by members of the academy as compared with articles by nonmembers are interesting mainly in showing a progressive diminution in the percentage of articles by members, despite the increase in membership of the academy. If there are

obstacles which can be removed and which hinder members of the academy from printing in the Proceedings, would it not be well to make efforts to remove them? The academy represents the highest point in American research, and if the Proceedings should actually contain articles representing the totality of the investigations of members of the academy it would thereby become largely representative of all American research and of very high grade, and furthermore it would be more truly the Proceedings of the academy in the sense that corresponding publications of foreign academies are representative of their research.

The average length of articles has varied very little and is satisfactory.

The vote in regard to changing the style of headings for articles and the size of the type in the Proceedings was almost unanimous in favor—as a war-economy measure—of printing the Proceedings in 10-point type and of using the text type instead of Cheltenham for the headings, consequently your chairman and managing editor have ordered the changes made beginning with the January issue.

E. B. Wilson, *Managing Editor.*

I shall now stop to mention some ways in which the development of the Proceedings had even in these three years departed from the plan. First was the difficulty I ran into in the very first year. When I was asked by Chairman Noyes to canvass for papers from my friends at Harvard and Yale, it appeared at once that many of my friends were opposed to the Proceedings ever having started. This was not so much because they did not want a journal as because they did not see how the Academy could pay for it. The Academy's extremely narrow margin for the support of the Proceedings had been frankly discussed by the Special Committee in its report reprinted above. The suggestion of support by the Government fell through. The guarantee fund for the period of the first five years was raised and the dues were increased as recommended. The establishment of the Proceedings was in fact an act of faith in the future. Those actively behind it felt confident that the demand for such a journal as the Announcement indicated would be so great that within five years paid subscriptions would carry most of the cost. Naturally those who did not share such hopes were hesitant to add to costs they saw no way of meeting.

Next was the provision in the second report that the Managing Editor refer each manuscript on its receipt to one of the members of the Editorial Board as a referee and, in case of doubt, to at least two other members of the Academy. For just what happened I have only hearsay evidence submitted to me in confidence by a personal friend who had been in the business meeting of the Academy who said that he had moved that the papers should be accepted on the recommendation of the members communicating them. He said he had maintained that the proposed plan of refereeing would delay publication, that brief first announcements were not definitive publication and that, as such, a member should assume the total responsibility for the propriety and scientific excellence of any manuscripts he communicated, and that the Academy had accepted his view. At any rate the refereeing was dropped and has never been reactivated. The Editorial

Board therefore became free of any duty to edit, which must have been welcomed by them, and had only the duty of doing what they could to channel the right kind of articles, whether of their own or of others, to the Managing Editor.

There was, however, one rule laid down by Chairman Noyes that no article should be critical of the work of others, because controversy should be avoided for the reason that the Proceedings was a "privileged journal" in the sense that no one but a member could cause an article to be printed in it. Once in a long while the Managing Editor has had to call the attention of a member to this rule and to request that some statement be made less overtly critical of another. One cannot object to a member's stating the results which he communicates or even mentioning that they seem to be not in accord with some already published somewhere by others; for the results of science, depending as they do upon observations at best subject to accidental and even systematic errors, are often subject to improvement. The members have always seen the propriety of cooperating with this rule.

Third, there was the minute, adopted with the acceptance of Chairman Noyes's report, that members and others presenting accounts of their researches at meetings of the Academy be expected to furnish the home secretary at the time of the meeting with a written description of such researches in form suitable for publication in the Proceedings. So far as the Managing Editor heard there was little attention paid to this minute, which was one of the reasons he referred in his report on the first three volumes to the lessening of the proportion of papers by members. And for emphasis Raymond Pearl repeated it in his first report.

Following Arthur A. Noyes, Raymond Pearl was made Chairman of the Editorial Board in 1918 and so continued until his sudden death in November 1940. His first report contains an important statement of policy and is as follows (Ann. Rep. 1918, pp. 19–20):

REPORT OF THE EDITORIAL BOARD OF THE "PROCEEDINGS."

The board submits to the academy the following report of its activities:

1. Three volumes of the Proceedings have been completed and four numbers of the fourth volume have been issued.

The statistics as to the make-up of the third volume, both in respect of subject matter and of source of the contributions, have been printed in the Annual Report of the Academy for 1917, and need not now be repeated except so far as covers one point.

The statistics of articles by members of the academy as compared with articles by nonmembers are interesting mainly in showing a progressive diminution in the percentage of articles by members, despite the increase in membership of the academy. If there are obstacles which can be removed and which hinder members of the academy from printing in the Proceedings, would it not be well to make efforts to remove them? The academy represents the highest point in American research, and if the Proceedings should actually contain articles representing the totality of the investigations of members of the academy, it would become thereby largely representative of all American research and of very high grade;

and, furthermore, it would be more truly the proceedings of the academy in the sense that corresponding publications of foreign academies are representative of their research.

2. At the autumn meeting the terms of office of five members of the editorial board expired, and new appointments were made by the council as follows: Jacques Loeb, W. M. Wheeler, E. B. Frost, E. L. Thorndike, and E. H. Moore.

3. At the autumn meeting the board decided to put into operation certain changes in the typographical make-up of the Proceedings in the interest of economy. These changes have been made with satisfactory results.

4. The editorial board is of the opinion that in view of the now established and recognized position of the Proceedings as a medium of scientific publication, the members of the academy might well contribute more of their own papers to its pages than they now do, both from the standpoint of self-interest as well as from a sense of duty to the academy and what it stands for. In this connection the board would recommend that the academy adopt as a general principle the policy of requiring each recipient of a grant for research from any of its special funds to publish some account of the results of the researches under the grant in the Proceedings.

5. If the above recommendation is adopted, the board would further recommend that the academy suggest to the several committees having in charge trust funds from which grants are made that whenever accounts of researches under grants are published in the Proceedings there shall be paid over from the trust funds out of which the grants are made to the Proceedings account, if such action be permissible under the terms of the bequest, a sum of money to cover the expense of the publication at a rate of $6 per printed page.

Respectfully submitted.

RAYMOND PEARL, *Chairman.*

This report of the editorial board was in line with the previous report of the managing editor, including for emphasis one identical paragraph, and was recommended by the Council for adoption in the following abbreviated form (Ann. Rep. 1918, pp. 19-20):

That members of the academy be requested to contribute their own papers to the Proceedings.

That the policy of requiring each recipient of a grant for any research from any of the special funds to publish an account of the results of the researches under the grant in the Proceedings be approved.

That the academy request the committees and trustees of the several trust funds of the academy from which grants are made that whenever accounts of researches under grants are published in the Proceedings there shall be paid over, from the trust fund out of which the grants are made, to the Proceedings account, if such action is permissible under the terms of the bequest, a sum of money to cover the expense of the publication.

The Academy adopted these recommendations and the home secretary was instructed to bring them to the attention of the members of the Academy and the chairmen of the trust funds.

REPORT OF FINANCE COMMITTEE OF THE "PROCEEDINGS."

The estimated net cost of the Proceedings for 1918 is $5,600.

The estimated income is as follows:

From subscriptions (provided each member of the academy becomes responsible for one subscription)	$1,800
One-third guaranty fund of $2,500 is	833

Estimated income of Billings fund	187
Sundry other income (members' dues, $850; N. R. C., $400; Dr. Walcott, special, $100)	1,350
Total estimated income	4,170
Total estimated deficit	1,430

If recommendation of the editorial board that space for reports of special grants in Proceedings be specially paid for be adopted, this deficit will be reduced to $1,200.

The committee plans to raise funds to meet this deficit.

C. B. DAVENPORT, *Chairman.*
FRANK R. LILLIE.
RAYMOND PEARL.

With the establishment of the National Research Council there came into the Proceedings a much larger amount of administrative action as proceedings of that adjunct of the Academy than had been contemplated by the Announcement in its statement that "the Proceedings, as the official organ of publication of the Academy, will contain reports of its business and scientific sessions, notices of Scientific and Biographical Memoirs . . ., announcements of awards of medals and research grants, . . ., and statements as to other activities of the Academy." Indeed with the relaxation in the publication of short scientific papers due to the preoccupation of the members with wartime activities, the entire balance of the Proceedings altered. Although the payment for the publication of this administrative activity by funds available to the Academy through the National Research Council was an aid to its precarious budget for the Proceedings, the imbalance was distressing to a good many members of the Academy. This was reflected in the report of Chairman Raymond Pearl in 1919 as follows:

REPORT OF THE EDITORIAL BOARD OF THE PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The editorial board reports as follows regarding its activities during the past year:

Volume 4 of the Proceedings has been completed and the numbers of volume 5 are being regularly issued each month.

The articles in volume 4 of the Proceedings may be summarized as follows: Mathematics, 9; astronomy, 11; physics and engineering, 25; chemistry, 5; geology and paleontology, including mineralogy and petrology, 9; botany, 3 (see also genetics); zoology, including general biology, 12 (see also genetics); genetics, 6; physiology and pathology, 10; anthropology and psychology, 1; a total of 91 articles. The division of these articles between members of the Academy and nonmembers is 39 and 52, respectively.

The list of institutions which have contributed three or more articles is as follows: Carnegie Institution, 15, divided as follows: Solar observatory, 7; nutrition laboratory, 4; geophysical laboratory, 1; marine biology, 2; station for experimental evolution, 1. Harvard University, 15; Brown University, 7; University of Illinois, 5; Bermuda Biological Station for Research, 4; University of California, 4; University of Chicago, 4; University of Pennsylvania, 4.

On April 28, 1919, the editorial board held its annual meeting, the following members being present: Messrs. Pearl, Wilson, Day, Hale, Clarke, Jennings, Lusk, Mayor, Millikan, A. A. Noyes, W. A. Noyes, Thorndike, and Wheeler. In regard to the general editorial policy of the Proceedings, it was held to be desirable to make the Proceedings, in so far as possible, a publication of permanent original, scientific value, in which duplication of publication should be avoided so far as was consistent with the general policy which has prevailed in the Proceedings throughout its existence of publishing short articles embodying a brief statement of the results of important researches which were eventually to be published in detail elsewhere. It was agreed that the rule of the Proceedings requiring prior publication should be waived in the case of summaries of an extended series of papers, some (if not all) of which had already appeared elsewhere, provided that the summary was so written as to be of practical use in enforcing the points made in individual papers and in attracting the attention of workers in related fields, thus making the summary in the Proceedings a real contribution to the subject.

It was agreed in general to adhere to the present policy of the Proceedings in regard to having the bulk of its contents made up of numerous short articles of first-class quality, falling in general under the six-page limit. It was thought desirable, however, to continue the policy of accepting longer articles under special circumstances, 12 to 15 pages being regarded as a proper maximum length for such articles. It was agreed that the managing editor and the chairman of the board should have all reasonable freedom in exercising their judgment on the administration of policy as to length of articles in particular cases.

A special joint committee of the editorial board of the Proceedings on the one hand, and the National Research Council on the other hand, met and considered the general question of the future relations of the National Research Council and the Proceedings. The special committee was constituted as follows: For the editorial board, the chairman, the managing editor, and Dr. Day; for the National Research Council, Drs. Hale, Merriam, and Yerkes. The general policy worked out by this joint committee was agreed to by the editorial board. It was in effect this, that the Proceedings of the National Academy of Sciences should become in a broader sense than had been true in the past, representative of the activities of the National Research Council, as well as of the National Academy. It was understood that the National Research Council should offer to the Proceedings as official communications of the Research Council of the National Academy such material (intended for publication as bulletins of the council) as the council considered to be of permanent scientific value in the Proceedings. It was felt that in view of the proposed enlargement of the scope of the Proceedings to represent the activities of the National Research Council that some changes in the typography of the Proceedings might be desirable and it was agreed that changes looking to the improvement of the Proceedings in this regard would be inaugurated as soon as agreement on the matter had been reached between the conferees from the two interested bodies.

Although no formal report can be made on the matter at this time, the editorial board is in possession of information which leads it to hope that the financial support of the Proceedings will be more adequately provided for in the near future. In this event the editorial board expects to inaugurate, with the approval of the council of the Academy, certain changes in details of policy which will be in the direction of more liberal arrangements between the Proceedings and its contributors, particularly in the matter of providing a certain number of free reprints to authors. The wisdom of such policy has always been clear to the editorial board, but the simple fact of lack of available funds in the past has made it impossible for the board to carry out its wishes in this matter.

Respectfully submitted.

RAYMOND PEARL, *Chairman.*

The negotiations between representatives of the Academy and of the Research Council resulted in the following action of the Council of the Academy (Ann. Rep. 1920, p. 33):

BUSINESS OF THE COUNCIL

PROCEEDINGS.

The following recommendations of the joint committee of the National Academy of Sciences and of the National Research Council upon publications were approved:

1. That the National Academy of Sciences and the National Research Council cooperate in the publication of the Proceedings, beginning with Volume VII.
2. That the material published in the Proceedings consist only of articles in brief form of permanent scientific value.
3. That the management of the Proceedings be vested in an executive committee of three, consisting of the managing editor as chairman, for a term of one year, of a representative of the Academy and a representative of the National Research Council, each to be appointed for a term of three years.
4. That the editorial board consist of the home secretary and the foreign secretary of the Academy, the chairman and the permanent secretary of the National Research Council as ex-officio members, and in addition of 10 representatives of the Academy and seven representatives of the Research Council, these numbers corresponding to the number of sections of the Academy and the number of divisions of science and technology of the Research Council.
5. That, beginning with Volume VII, the financial responsibility of the Proceedings be shared equally by the National Academy and the Research Council.
6. That, beginning with Volume VII, the operation of the Proceedings be placed upon a budget basis the size of the volume in any year to be determined by the conditions of the budget, the equal amounts contributed by each organization being determined by mutual agreement before the beginning of each calendar year.
7. That the managing editor of the Proceedings be appointed by the council of the Academy and the executive board of the National Research Council upon the nomination of the editorial board.

This action made it necessary to keep the cost of the Proceedings within a limited budget and resulted in a somewhat reduced size pending efforts to find additional support. It left the administration to an "Executive Committee" of three, consisting of the chairman of the Editorial Board (Raymond Pearl) and the Permanent Secretary of the National Research Council (Vernon Kellogg) with the Managing Editor as Chairman.

At this point I want to call attention to the 56-page symposium "A Survey of Research Problems in Geophysics" (Vol. 6, pp. 545–601) prepared by chairmen of Sections of the American Geophysical Union. It seems to me that the collection of papers was very influential in blocking out geophysical research that needed to be done and thus brought about its doing. This symposium was part of a considerable activity in the Research Council to get science started up actively through making reviews of the then present frontiers of science in such a manner as to suggest problems for

attack. Three previous research analyses of this sort had been: "Some Problems of Sidereal Astronomy" by Henry Norris Russell (Vol. 5, pp. 391–416); "The Larger Opportunities for Research in the Relations of Solar and Terrestrial Radiation" by C. G. Abbot (Vol. 6, pp. 82–95); and "Scientific Research for the National Defense as Illustrated by the Problems of Aeronautics" by Lt. Col. George O. Squier, USA (Vol. 2, pp. 740–742), an abstract, listing a large number of problems needing solution.

In connection with the reorganization, those elected members of the Research Council who were not members of the Academy were given the same right and responsibilities as members of the Academy in the matter of communicating research articles to the Proceedings.

Volumes 5 and 6 had 613 and 722 pages, showing a good recovery from wartime; but with the restricted budget available to the Executive Committee, volume 7 was cut back to 367 pages, and the only administrative matter was the "List of Publications of the National Academy of Sciences and of the National Research Council" (pp. 339–362), which was to show the background from which the new arrangement started. Volumes 8 (373 pp.), 9 (446) and 10 (507) remained small; volumes 11 (789) and 12 (783) were getting back to prewar size, although there was not the earlier pressure of solicitation from members of the Editorial Board.

Table 1 gives the comparison between volumes 1–6 and 7–12 of the distribution of articles over the standard sciences: (1) mathematics, (2) astronomy, (3) physics and engineering, (4) chemistry, (5) geology and paleontology, (6) botany, (7) zoology, (8) genetics, (9) physiology and pathology, (10) anthropology and psychology. It is there seen that in both six-year periods physics had the highest number of articles by a considerable margin and that in the first mathematics was second with geology, zoology and physiology tied with it, but in the second period mathematics was alone in second place. In the first sexennium 62% and in the second 75% of the articles were in the physical sciences if geology and paleontology

TABLE 1

DISTRIBUTION OF THE SCIENCES OVER THE TEN CHIEF DIVISIONS

	1	2	3	4	5	6	7	8	9	10	Total
Vols. 1–6:											
No.	92	107	154	81	92	33	91	68	90	41	849
%	10.8	12.6	18.1	9.5	10.8	3.9	10.7	8.0	10.6	4.8	
Vols. 7–12:											
No.	140	60	290	67	33	10	44	59	62	17	782
%	17.9	7.7	37.1	8.6	4.2	1.3	5.6	7.5	7.9	2.2	
Vols. 13–22:											
No.	419	85	389	176	70	56	115	201	126	52	1689
%	24.8	5.0	23.0	10.4	4.1	3.3	6.8	11.9	7.5	3.1	

be included therein despite the fact that paleontology deals with former life. It should be particularly noted that in the second sexennium physics itself (including engineering which uniformly ran low) accounted for more than one-third of all the articles. Although still first early in the third sexennium, physics shortly thereafter fell far below mathematics and somewhat below genetics.

Such unequal coverage of the different sciences has been typical of the whole history of the Proceedings. It has led to enthusiasm for the Proceedings on the part of those members and other scientists who have found in it articles of professional interest and importance to them and to criticism from those who have found little if anything in the Proceedings of their liking. The case for criticism lies entirely in the hands of the members; those who are contributing might write, as was always intended, in a manner more intelligible and interesting to the general membership, and those who are not contributing could see that scientific findings of interest to them were sent to the Proceedings to publish. There seems to be evidence that there was a good deal of activity of this sort during the first six years but very little of it since then.

In 1927 with volume 13, there appeared as Part II of number 1 a brochure entitled *Publications of the National Academy of Sciences of the United States of America (1915–1926)*. It ran to 197 pages in three parts as follows:

I. Index to the First Ten Volumes of the Proceedings (1915–1924).
II. List of Other Publications of the Academy from 1863–1926.
III. List of Publications of the National Research Council from 1916–1925.

The Index was a subject and author index combined as in the custom of the Proceedings, pp. 1–113, with about 4900 entries. Part II (pp. 114–127) listed the Memoirs I–XXII pt. 1, the Biographical Memoirs I–XI, Reports of Committees and Annual Reports for 1863–1925. And Part III (pp. 128–197) listed the publications of NRC and its fellows and some papers originating in the activities of its committees. Although published as Part II of number 1 of Volume 13 dated January 15, 1927, the brochure itself was dated "Published November 1, 1926," and priced $1.50. I had nothing to do with the preparation of the brochure; it was prepared in Washington, presumably under the direction of Paul Brockett, widely known for his bibliographies of the progress of aeronautics, and then serving as assistant to the president of the Academy.

The Editorial Board at this time consisted of the Home Secretary (David White) and the Foreign Secretary (R. A. Millikan) of the Academy, the Chairman (Gano Dunn) and the Permanent Secretary (V. Kellogg) of the Research Council, and the following 17 members, 10 being for the Academy and 7 for the Research Council as by the agreement of 1920 cited on page 15:

J. S. Ames*	R. G. Harrison†	W. J. V. Osterhout†
L. J. Cole*	L. Hektoen*	F. Schlesinger†
A. L. Day†	L. J. Henderson†	H. S. Washington†
W. Duane†	F. B. Jewett*	W. M. Wheeler†
G. Dunn†	A. V. Kidder*	David White*
W. J. Hale*	E. H. Moore†	

* Research Council representative. † Academy representative.

In the report of Raymond Pearl (p. 14) of the agreement between the special joint committee of the editorial board of the Proceedings and the National Research Council he stated: "It was understood that the National Research Council should offer to the Proceedings as official contributions of the Research Council of the National Academy of Sciences such material (intended for publication as bulletins of the council) as the council considered to be of permanent scientific value in the Proceedings." Although this statement was not specifically incorporated in the statement by the Council of the Academy (p. 15) I had been expecting to receive for publication some such materials from the Research Council. Having received none, it interested me to note that in Part III of the brochure none of the Bulletins listed as published after the date of the agreement had been offered to the Proceedings, and I judged that none of them were in fact "articles in brief form of permanent scientific value" as specified in section 2 of the statement by the Council of the Academy; they were too long. There were, however, listed among the Reprint and Circular Series the research analyses cited above (p. 15) and I had hoped that similar, if somewhat briefer, contributions would be coming to me to print. As none came I could only assume that for some reason the Research Council felt it had nothing to offer the Proceedings which met the conditions of the agreement. This was a great disappointment because many of the shorter research papers coming out of the large engineering division of NRC seemed just the sort of material which did meet the terms of the agreement and could be published in the Proceedings to the advantage of the journal, of the Academy and of the Research Council in relieving the great dearth of engineering research in the pages of the Proceedings. But I recognized that it was for the Research Council to decide where the material could best be published, and I was very glad to see that in the long list of publications by National Research Council Fellows there were many which were cited as in the Proceedings and which I knew to be excellent research.

So much for the special brochure of November 1, 1926.

There was one very encouraging development at about this time. In Pearl's report of 1919 (p. 14) he had expressed the hope that better financial support might be found for the Proceedings and he had steadily sought for it. In his report as representative of the Academy on the executive committee of the Proceedings (Ann. Rep. 1927, p. 14) he could state:

> Some relief to the financial situation of the Proceedings has been found in an appropriation from outside sources which is available for defraying the cost of publishing brief original scientific papers which may exceed the limit of six pages imposed by the editorial board of the Proceedings. One reason for the imposition of this restriction on the length of articles is that the Proceedings accepts brief summaries of material to appear practically at the same time in extenso in technical journals and it seems desirable that to avoid duplicate publication these summaries should be kept exceedingly brief. Another reason for imposing the restriction is that in a mixed journal which contains articles on a variety of sciences and is intended to

contain matters in one science of interest to workers in another, it is desirable that all articles should be brief. The special appropriation for longer articles does not apply to those which are summaries, as it should not, and in accordance with the general policy of the Proceedings is restricted to articles which though exceeding the six page limit are still brief. No article so long as 12 pages has been printed. The space occupied by those contributions between 6 and 12 pages in length is about one-fifth of the total volume of the Proceedings. The acceptance of this type of article has increased the average length of the communication to the Proceedings from 4 pages to 4½ pages, as might naturally be expected.

I should remark that as Managing Editor I have never set policy; that is the duty of the Chairman in conference with his editorial board and with the consent of the Council of the Academy. My problem is to carry out the policy set, which is enough for one person or, as it was during the period covered by this chapter, for the executive committee. Although I was chairman of that committee, policy matters were cared for by the other two members, who at that time were Pearl for the Academy and Kellogg for the Research Council. How they took care of it I never knew; they often discussed with me the practical matters connected with carrying out policy under consideration and generally asked me for any suggestions as to policy that I might wish them to consider.

As to the amount of money available for these longer articles, which in themselves constituted a change of policy, I never had any precise idea. With the elasticity in the budget, due to a backlog of unspent income, which it was necessary to have, I could accept the longer articles as presented and charge their cost to the fund and straighten things out later if I had overdrawn it. My impression is that over the years 1926–34 it amounted to something around $10,000. The first article of this class was by G. N. Lewis on "The Nature of Light" in volume 12, pp. 22–29, and was of 7 pages; it was a testimonial to his originality and his logic, but unorthodox as he stated at the start.

So many members had taken advantage of the provision for longer articles while the money lasted that they were anxious for the privilege to continue, but this the Academy could not afford; it was agreed, however, to meet them part way by letting them pay for the overrun above six pages, the Academy carrying the cost of the first six. It was not a comfortable plan to administer for it is always difficult to know in advance just how much space the printer will take, and authors tend to underestimate the excess space.

In November 1940 Raymond Pearl suddenly died. The following note should be a part of this history (Ann. Rep. 1941, p. 18):

It is a sad duty to call attention to the death of Raymond Pearl, who over so many years served the Academy and the National Research Council in so many ways, including a long-continued interest in the Proceedings. In succession to Arthur Noyes, Mr. Pearl became chairman of the editorial board, beginning with volume 4 (1918) and continued in that capacity until after the conclusion of the arrangement between the Academy and the National

Research Council for joint responsibility for the Proceedings effective with volume 7 (1921); from that time to his death Mr. Pearl was the appointee of the Academy who, with the permanent secretary of the National Research Council and the managing editor, served on the executive committee of the Proceedings. He was especially active in raising a revolving fund to tide the Proceedings over difficult times and later when the Academy had temporarily some special funds to aid publication on a considerable front he was influential in making it possible for the Proceedings to publish articles which, while brief, exceeded the six-page limit which has always been imposed upon the length of our contributions except as special funds are available to cover the cost of any excess over that limit. The Proceedings owes more to Raymond Pearl than to any other person, except perhaps the one who may have been most influential in its original establishment.

The place of Pearl on the executive committee went to R. A. Millikan who served through 1949. He frequently remarked in the annual business meeting that the original idea of the Proceedings to serve for brief communication of new scientific findings to fellow members and to those who might read the journal, without the elaborate detail desired by the specialist, was the sound policy for the journal. He had been elected in 1915, the year the Proceedings started, and had come on the editorial board as early as 1916, and been a considerable contributor to the Proceedings from 1916 to 1935.

There had been other changes. As the Permanent Secretary of the Research Council, Vernon Kellogg had been succeeded in 1936 by Ludvig Hektoen and he by Ross Harrison in 1938, who served until Detlev Bronk took his place from 1947 through 1949.

It was not only the prominent personnel on the Proceedings that was changing; the policy, or at any rate the practice, of the Academy was changing. The Academy's Constitution, Art. II, Sec. 4, provides: "The Academy shall be divided by the Council into sections representing the principal branches of scientific research." When the Academy was organized these branches were stated as: (1) Mathematics, (2) Physics, (3) Astronomy, Geography and Geodesy, (4) Mechanics, (5) Chemistry, (6) Mineralogy and Geology, (7) Zoology, (8) Botany, (9) Anatomy and Physiology, (10) Ethnology. The members were free, as they are now, to select the section to which they belonged. This is much the same list as we had when the Proceedings was started. It proceeds roughly in the order in which the sciences have emerged.

Inasmuch as the rule for classification of articles in the Proceedings is that they are to be classified as in some one of the "principal branches of scientific research" into which the Council organizes the Academy, and inasmuch as there always have been, and presumably always will be, members who are dissatisfied with any rule for classification, it appears that a bit of history of the matter is germane to this history of the Proceedings. Dr. F. W. True of the Smithsonian Institution, in his volume "A History of the First Half-Century of the National Academy of Sciences, 1863–1913," which appeared in connection with the Semi-Centennial in April, 1913, summarized

the efforts at revision of the classification between 1863 and 1911 somewhat as follows (on pages 68–70):

> The original classification [given above] lasted until 1872, when the whole system of classes was abolished.
>
> The matter came up again for consideration in 1885, when it was proposed to divide the membership into four sections, but this proposition was rejected. Notwithstanding . . ., the subject was brought forward anew and . . . referred to a committee which, in 1890, reported in favor of the re-adoption of a classification . . . . As to the method of classification the committee remarked that "the task of fixing upon this is far more difficult now than it was when the National Academy was founded, nearly thirty years ago. In fact, it appears well nigh impossible to establish one so that it shall be both strictly scientific, according to present ideas, and at the same time practical. Your committee therefore propose a classification closely similar to that originally established, and believe that, however liable to technical criticism, it is essentially such as is least likely to meet with difficulties in its practical working." This report was referred to the Council and the subject continued under discussion for nine years longer before a new decision was reached. In April, 1892, the Academy adopted a resolution declaring that a reorganization into sections was desirable, and in November . . . a committee reported in favor of the classification. . .: (1) Mathematics, including Astronomy and Geodesy. (2) Physics. (3) Engineering, including Civil, Mechanical, Electrical, Hydraulic, etc. (4) Chemistry, including Applied Chemistry. (5) Geology, including Mineralogy, Paleontology, etc. (6) Biology. (7) Anthropology, including Sociology, Economic Science, etc. . . . This report was referred to the Council and was printed and distributed to the members of the Academy. In 1894 the Council reported in favor of still another classification: Class A. Mathematics and Astronomy. Class B. Physics and Engineering. Class C. Chemistry and Mineralogy. Class D. Geology and Paleontology. Class E. Biology. Class F. Miscellaneous. This report was held under advisement until 1899 when an amendment to the constitution was adopted providing for the division of the Academy into six standing committees . . .: (1) Mathematics and Astronomy. (2) Physics and Engineering. (3) Chemistry. (4) Geology and Paleontology. (5) Biology. (6) Anthropology.
>
> This classification was amended in 1911, the committees on Biology and Anthropology being replaced by four separate committees: (a) Botany, (b) Zoölogy and Animal Morphology, (c) Physiology and Pathology, and (d) Anthropology and Psychology.

This long quotation covers the change from the original classification of 1863 to none in 1872, the long discussion from 1885 to 1899 leading to a classification into six committees mentioning nine sciences, and finally to a classification into eight committees mentioning fourteen sciences in 1911. But this does not take us to January 1915; for in April 1914 the committee or section of Mathematics and Astronomy was split into its two components, making nine sections but still fourteen sciences. During some of this time a member could under certain conditions belong to two committees or sections.

There have been more changes since the Proceedings started. In November, 1919, Physics and Engineering was split into its two components, making 10 sections and still 14 sciences. In 1932 Physiology and Pathology was divided into Physiology and Biochemistry on one hand and Pathology and Bacteriology on the other, thus making 11 sections with 16 sciences.

In 1942 Geology and Paleontology dropped the second science, reducing the number of principal sciences to 15. In 1948 Anthropology and Psychology were divorced into separate sections, making 12 sections with 15 sciences. In 1951 Geophysics was made a section and their number became thirteen with 16 sciences. In 1954 Physiology and Biochemistry were divorced resulting in 14 sections for the 16 sciences, and in 1957 Bacteriology was renamed Microbiology. There is little indication that this tinkering with the classification will cease. It is in part a conflict between broad scientists who wish few principal sciences, and specialists in particular lines who wish their line recognized.

The only classification used by the Proceedings but not recognized in the names of sections is genetics, which may be botanical, zoological, or human. The reason for its use is that before the rule for classification was adopted there were on the Editorial Board and in Chairman Pearl members who were ardent geneticists who channeled so many papers in genetics to the Proceedings that the journal acquired a reputation in the field and the question of dropping the classification has never been seriously proposed. Were genetics to be disallowed as a classification it would be easy to put the articles into botany or zoology, or if they dealt with human heredity into physiology or pathology or anthropology. Indeed, entirely apart from the case of genetics the classifications in the biological sciences are not clear cut. The botanists have never given up plant physiology to physiology, and psychology has articles in the physiology of the senses, and many a member not in the section of biochemistry sends in articles which are so classified. On the other hand there was the article a dozen years ago by the distinguished anthropologist A. L. Kroeber on "Sign and Symbol in Bee Communications" commenting on some aspects or interpretations of the work of our foreign associate von Frisch which carried the classification anthropology, presumably because it was an anthropologist's interpretation, though the subject was zoological. Many of our articles could be classified in several ways. There are those classified in biochemistry which could be in one or another of the biological fields or even in chemistry as such. Twenty years ago, long before the recent explosion of biochemistry into the Proceedings, Walter Cannon, then Foreign Secretary, pointed out to me the broad spread of biochemistry; it has become even broader since then.

If these paragraphs on classification seem to overemphasize the matter, I can only say that it is one of the most annoying with which the Managing Editor has to deal, and he wishes the contributors to the Proceedings would remember the wise words of the 1890 committee that a system of classification, however liable to technical criticism, should be such as to be least likely to meet with difficulties in its practical working.

Table 1 shows that the average number of articles in the first six volumes was 142, in the next six 130 and in the next ten 169. An examination of the

record by individual years shows great variation. For example in the ten volumes 13 to 22 the average for the first three was 200, for the next three 148, in volume 19 there was a jump back up to 200, but for the last three a retreat to 149. On the whole the Proceedings seemed to be losing ground, and it certainly was relatively to the membership of the Academy which was increasing from 240 to 330 during the decade. But a worse decade was ahead with depression and war. At the Annual Meeting of 1947, I reported figures for volumes 23 to 32 which, reduced to conform with Table 1, are as in Table 2. It will be noticed that volume 28(1942) was not off much, but the next four were below volume 4(1918), and Table 3 will show that volumes 33 to 36 remained below the prewar average of 23 to 27; a real advance came with volume 37(1951).

TABLE 2

DISTRIBUTION OF THE SCIENCES OVER THE TEN DIVISIONS

(1) mathematics, (2) astronomy, (3) physics and engineering, (4) chemistry, (5) geology and paleontology, (6) botany, (7) zoology, (8) genetics, (9) physiology and pathology, (10) anthropology and psychology.

	1	2	3	4	5	6	7	8	9	10	
	No. of Articles										Total
Volume											
23	40	8	11	9	3	8	12	22	21	2	136
24	43	7	8	5	4	4	12	12	22	1	118
25	51	12	10	9	3	9	7	21	11	10	143
26	49	22	7	11	0	8	10	14	9	4	134
27	45	11	7	12	0	8	14	29	8	2	136
Total	228	60	43	46	10	37	55	98	71	19	667
Per cent	34.2	9.0	6.4	6.9	1.5	5.6	8.2	14.7	10.6	2.8	
Volume											
28	47	10	5	8	1	11	8	17	7	2	116
29	35	0	0	3	0	8	4	20	11	0	81
30	26	2	9	0	0	4	3	26	10	1	81
31	35	0	5	1	0	4	6	10	20	0	81
32	36	0	3	0	0	0	1	21	8	0	69
Total	179	12	22	12	1	27	22	94	56	3	428
Per cent	41.8	2.8	5.1	2.8	0.2	6.3	5.1	22.0	13.1	0.7	

In 1947 I also called attention to the impending budget difficulties in these words: "It will not do to overlook the fact that printing costs have risen sharply in the past two years and that, unless the budget available for the Proceedings be correspondingly increased, it is not to be expected that the average size of the volume can be maintained." It may have been that this warning was premature, but mindful of the difficulties there had been in 1920, it seemed well to mention rising costs. The situation did not look dangerous in the Annual Report for FY 1947–1948 which showed in Exhibit

C, page 87, Proceedings income of $7,139.98 and expenses of $4,701.07, with a balance of unspent income of $33,190.39. I had not foreseen that recovery in the size of the volume would be so slow.

In 1947 Dr. A. N. Richards became President of the Academy. At the December 1947 meeting of the Council, to which he invited me, he took up the Announcement prefaced to the first issue of the Proceedings and remarked that the sooner we got back to it the better. This I took to be in line with the remarks our Chairman R. A. Millikan had made in the business meetings of the Academy that the original idea of the contents as to consist of first publication of brief articles reporting original research without elaborate detail and intelligibly to the general membership of the Academy was the proper policy for the Proceedings; but this was not specified. President Richards did, however, direct that the name of the communicator of an article by a non-member should be specified in print, and this I was able to do beginning with the issue of January, 1948.

It may be interesting as a matter of ancient history to say that this question as to what should be done about articles by non-members in respect of stating the responsible member communicating the article had been actively discussed by the Editorial Board in the early days. For the first two volumes those opposed to printing the name won. Then those wanting it printed won and it was printed for volume 3 to volume 8, No. 4, when those opposed to printing it won and from No. 5 of volume 8 through volume 33 it was not printed. The Managing Editor was always under instructions to keep a record of the communicator to be used if needed in connection with any question of the propriety or scientific merit of the article for both of which the communicator is editorially responsible.

A second change came when President Richards had his assistant Raymond Zwemer send me copy for the "Organization of the Academy" to be inserted in the July issue of 1948. The Proceedings had carried in early days in the front matter of each volume just after the Table of Contents a plain list of "Officers and Members of the Academy" as of November 15, with names in capitals and small capitals and institutional connection in italics, all in 8-point type. It was really not a mailing list because it was understood that the Academy did not wish to distribute one to all the world. It was but part of what the Announcement promised as "reports of its business and scientific sessions and of actions taken by its Council, notices of the Scientific and Biographical Memoirs printed for the Academy by the United States government, announcements of the awards of medals and research grants made from its trust-funds, and statements as to other activities of the Academy." All this was given up in the financial stringency of 1920 to conserve all the budget for the brief research papers, and because the increase

of activities via the recently established National Research Council would have taken too much of the journal if covered with the adequacy formerly promised for the Academy. Only the address list has come back, but with the present size of the Proceedings the account of all the activities, including those of the Research Council, could be taken on without dangerously adding to the cost of the Proceedings.

The volumes had been small during the war and immediately after, the low being volume 32(1946) of 336 pages with 33(1947) of 397, but 34(1948) climbed to 624 pages. In the report of April 1949 it was said: "In accordance with the experience after the First World War we note that there has been a considerable increase in the size of the Proceedings, the volume for 1948 being more than 50% larger than the average for the preceding three years. Costs have more than correspondingly risen, for the cost per page has been rising from $10.10 in 1945 to $13.48 in 1948. The mailing list has also risen with the resumption of foreign mailing from 1,362 in July 1945 to 2,022 in July 1948 and is now about 2,100, which is markedly larger than any prewar figure." Finally, with volume 35(1949) of 720 pages the Proceedings could be said to have returned to its prewar size. It was the last under the Executive Committee. In reporting on it in April 1950 I said: "The cost of publication is now about double the budget and the publication can continue to run on income saved in the lean years only so long as the accumulations last, and thereafter the budget must be increased or the size of the Proceedings reduced, or both."

CHAPTER III. THE LATER YEARS

In the spring of 1950 President Richards announced that the Proceedings would return to its initial status with an Editorial Board of fifteen members plus certain members ex officio as follows:

LINUS PAULING, Chairman — EDWIN B. WILSON, Managing Editor

FRED E. WRIGHT, Home Secretary — ROGER ADAMS, Foreign Secretary

D. W. BRONK, Chairman of the National Research Council

J. W. Beams	G. W. Beadle	Gregory Breit
R. E. Cleland	E. A. Doisy	L. C. Dunn
W. W. Rubey	G. C. Evans	C. S. Marvel
Harlow Shapley	C. H. Graham	J. von Neumann
F. E. Terman	J. T. Patterson	W. H. Taliaferro

This Editorial Board was appointed to serve from July 1, 1950, with the terms of the first column to last until June 30, 1954, those of the second column until June 30, 1953, and those of the third until June 30, 1952, with the understanding the terms thereafter would be for three years, that members might be reappointed, that the Board would meet annually at the time of the Annual Meeting of the Academy and at other times at the call of the Chairman, and that the Managing Editor would prepare for the new Board a statement of the background of the Proceedings. Thus, the Executive Committee was disestablished and the National Research Council was represented only by its Chairman and by those members of the Board who happened also to be members of the National Research Council. As D. W. Bronk was elected President of the Academy to take office on July 1, 1950, he was succeeded on the Editorial Board by the new Chairman of the Research Council, Douglas Whitaker, and he shortly thereafter by W. W. Rubey who served until his resignation in 1954, after which time Dr. Bronk served as Chairman of the National Research Council as well as President of the Academy until his retirement in 1962.

As Chairman Pauling did not call a meeting of the Board prior to the Annual Meeting of 1951 and I desired to include 1950 in my report on the background and then present state of the Proceedings, the report was not presented until the spring of 1951. Most of that report has been covered in greater detail in Chapters I and II of this History and will not be repeated. At the Autumn Meeting of the Academy in Schenectady in 1950 at the invitation of the General Electric Company, attended by only 83 of the approximately 450 members of the Academy, there was considerable discussion in the Business Session of the Proceedings of which I stated in my report that: "There were members who said that they wanted the Proceedings changed. Mostly these seemed to be those who did not contribute to it. Whether they would contribute to it if it were changed to suit them is not determin-

able." It was obvious that the members who spoke were not well satisfied with what the Proceedings was and on a showing of hands it appeared that a majority of those present were not satisfied, but though various suggestions were made for changes, it did not appear what changes would be on the whole satisfactory, and no action was taken. I did not even get a distinct impression that the majority wished a return to the shorter, more generally intelligible and interesting first announcements of new scientific results without much technical detail, as recommended by the previous chairman Millikan and as I thought was one of the things President Richards had in mind in his remarks of December 1947. However, from the fact the speakers had been mostly non-contributors, one might infer that such might be the case. At any rate I reported the situation to the new Board along with the Bylaw on the subject which then was and long had been, and for that matter still is, that "The Proceedings shall be primarily a medium of first publication for original articles in brief form, of permanent scientific value."

What this means has to be determined by the Council of the Academy on or without such recommendations as the Editorial Board may make. Inasmuch as the original recommendation of that Board, or its predecessor Committee, that the Board should have editorial powers, including a referee system for articles, was overthrown by the Academy itself in the very early days of the Proceedings by making the member who communicates an article its sole referee, the powers of the Board and the Managing Editor are clearly only advisory relative to what appears in the Proceedings, the communicating member being solely responsible. Moreover this freedom for the member seems to be strictly in accord with the provisions of the Constitution of the Academy concerning scientific communications in Article V, to wit:

Section 1. *Communications on scientific subjects shall be read at scientific sessions of the Academy, and papers by any member may be read by the author or by any other member, notice of the same having previously been given to the secretary.*

Section 2. *Any member of the Academy may read a paper from a person who is not a member and shall not be considered responsible for the facts or opinions expressed by the author, but shall be held responsible for the propriety of the paper.*

The second of these rules was adopted in the very same words by the Academy at its organization meeting in 1863; the first was worded differently but meant the same thing. Apparently if a member has wished to read a scientific paper to the Academy, it has never been within the powers of any officer of the Academy to deny him access to the program of the scientific sessions. This is a type of extremism relative to the academic freedom of academicians which has been traditional and possibly it was this which led the Academy to overrule the initial proposal for a system of refereeing for

the Proceedings and which has made it customary to accept for immediate publication whatever the members send in recommended for publication, except for reason of necessary correspondence relative to the copy. The members have lived up to their responsibilities as sole referees very well indeed; few have misused their privileges, unless it be by non-use.

When the Proceedings was established the Academy had no provisions in its constitution or bylaws limiting the length of papers read to it, but the articles in the Proceedings were limited from the start to six printed pages, which meant the equivalent of 3000 words and had remained limited to that except as the cost of additional length was met by funds supplementary to the budget.

The attention of the new Editorial Board was called to one more item—the distribution of the Proceedings. As of the end of the fiscal year in 1950 this was: 949 copies to 780 paid subscribers, 730 copies to members of the Academy and Research Council, 233 for the foreign free list, 18 for the domestic free list, 100 for stock at the Academy, 270 for stock at the press, making in all an edition of 2300 copies. The considerable number of copies for stock was to provide for back numbers needed in the future and especially for the steadily increasing subscription list. Before the end of 1950 the distribution had jumped to 2350 copies and had the press not made 175 extras, we should have been in an embarrassing position. The edition as of April 1951 when the new Board first met was 2500.

So much for background. The new Board at its first meeting recommended that the page allowance for members without payment for excess space be increased from 6 to 12 pages, with articles by non-members remaining at 6 pages. This was directly opposite to previous statements by all chairmen both as to length and as to discrimination against papers that members wished to communicate for non-members who were, often if not usually, associates working in fields close to their own. The reason that had been given for this policy of non-discrimination was that many members did not like to put themselves down as co-authors with their younger associates unless their own contribution was major. Whether individual members held this view depended largely upon custom in the particular branch of science in which they worked. At any rate the Council approved the recommendation and the Proceedings was off to a new start in the direction of longer and more technical articles in real competition with professional journals which the founders of the Proceedings especially wanted to avoid. In my report in 1952 I stated that this increase in permitted free space had not increased the average length of articles and that the proportion of articles signed by members remained at just under 40%.

A noteworthy scientific event of volume 37 (1951) was that Chairman Pauling, after an initial 6-page contribution in the April issue, published a series of 7 articles in the May issue running to a total of 51 pages constituting

what was practically a small monograph on his new findings about the structure of proteins. Although distinctly at variance from the past policy of the Proceedings, this contribution may well have made the issue of May 1951 the scientifically most distinguished of the first 50 volumes.

Before going on with the text, Table 3 will give a summary of the data concerning volumes 33 to 40 covering the eight years after President Richards suggested a return to the earlier organization and procedures as desirable. The same distribution will be kept, with geophysics combined with geology under 5. The following points may be noted. First, the actual average number of articles in the volumes grouped in Tables 1, 2, 3 did not increase from volume 1 to volume 40. In the six periods tabulated it was 141, 130, 169, 133, 86, 149. The smallest number ever recorded was

TABLE 3

DISTRIBUTION OF THE SCIENCES OVER THE TEN CHIEF DIVISIONS

	1	2	3	4	5	6	7	8	9	10	
	No. of Articles										Total
Volume											
33	40	1	6	5	1	5	5	14	6	0	83
34	42	6	14	2	0	5	5	17	17	1	109
35	51	1	11	7	3	4	8	24	13	4	126
36	46	6	11	6	2	6	3	24	20	2	126
37	76	12	8	13	1	2	3	21	18	4	158
38	76	5	7	18	2	6	6	31	30	3	186
39	65	9	13	19	2	9	10	41	30	1	199
40	77	9	23	14	13	3	11	31	31	4	216
Total	473	49	93	84	24	40	51	203	165	19	1201
Per cent	39.4	4.1	7.8	7.0	2.0	3.3	4.2	16.9	13.8	1.6	

79 in volume 32(1946); the largest was 209 in volume 14 (1928) until the very last which was 216 in volume 40 (1954). Between the years 1915 and 1954 the membership of the Academy increased from 138 to 528 and the number of sections from 10 to 13 and the average number of articles per member dropped from 1.2 to 0.4; if for statistical stability it were better to compare the averages for the first six and the last eight volumes, the articles per member per year would be 0.9 and 0.3 respectively, the same ratio of 3 to 1 but lower values. Verily the hopeful forecast of George Hale and other initiators of the Proceedings that the eagerness of the members of the Academy to get prompt publication of brief first announcements of their scientific findings and those of their associates would shortly result in a volume of 2000 pages with 500 articles averaging 4 pages in length had by 1954 turned out quite unrealistic, like so many social forecasts, whether hopeful or pessimistic. And the average length of the articles had increased from 3.7 to 6.2 (equivalent) pages in the forty years.

In the second place one should note that throughout the 40 years there was considerable stability in the division between the physical sciences (columns 1–5) and the biological sciences (columns 6–10). The percentages of the physical sciences in the six groupings of Tables 1–3 were successively 58, 75, 63, 58, 53, 60. The mean of these percentages is 61 with about a 10% variation around it. There had been a good deal of variability in the activity in some of the 10 columns, and also in the way of interchange in the serial order of the contributions in the fields of the ten in percentage contribution to the total number of articles published. The grand totals in the ten fields and their percentages are:

Number:	1531	373	991	466	230	203	378	723	570	151	5616
Per cent:	27.3	6.7	17.6	8.3	4.1	3.6	6.7	12.9	10.2	2.7	

From this it appears that on the whole Mathematics has a long lead with Physics and Engineering second and Genetics third. The poorest showing is that of Anthropology and Psychology; on the figures the second lowest subject is Botany but one has to bear in mind that Genetics is chiefly either Botany or Zoology and so it would not be unfair to rate Geology with its various subfields as second lowest. Had Engineering not been included with Physics for the reason that at the start it was not a separate section and because there has really been very little of it, despite the great activity of the Division of Engineering and Industrial Research of the National Research Council, it is probable that Engineering would have been one of the lowest.

In 1951 there was a sharp reduction in the circulation of the Proceedings due to a substantial reduction in the free list. The percentage of articles in Mathematics reached a maximum of 48, which resulted in cries of overspecialization and professionalization of the journal. The cost per page rose to $17.50, which despite the implied increase in the cost of the Proceedings did not deter the new Board from recommending the larger free page allowance to members or the Council from granting it. So the year is memorable in a number of respects. The number of pages in volume 37(1951) was 874.

In 1952 the volume increased in size to 1094 pages (up 220)— the largest ever published to that time. The cost was in excess of $20,000 and the deficit over the budget was probably between $7000 and $8000, but the income accumulated over the lean years could still cover it. As 1952 was the first full year after the free page allowance to members was increased to 12 pages, it was interesting to note that the excess over 6 pages but under 12 was about 50 pages. These excess pages accounted for only about 10% of the deficit. But in view of the increasing cost situation that had been on my mind for years, I undertook to make a survey of the total publishing program of the Academy and Research Council and came to the conclusion

that the Proceedings, measured in pages or in costs, was but a small part of that program, and probably not over 8% of the total pagination and only about 20% of the pages in the regular periodicals of the program. So far as I could judge, with possibly some personal bias, the Proceedings was fully up to the others in quantity and quality of the new scientific results it was publishing, and so would somehow be taken care of if a financial emergency arose.

However, mindful of the awkward situation which arose in 1920, and at the risk of being boresome, I ventured again in my report on volume 38 (1952) to refer to the fact that the accumulated income from the lean years was at last being eaten into at the rate of about 25% a year and that printing prices had recently been increased by 8%. At the time of writing, around April 1, there was no indication that the size of volume 39 would exceed that of volume 38. But by the end of the year it had become 1310 pages, up 216 or about 20%, which with the 8% in prices made an increase of some $4000 in total cost of the volume.

During the year 1953 there was long discussion of the situation of the periodicals and of the Proceedings in particular. It was decided that the Proceedings should be published for the Academy by the University of Chicago Press and the Biographical Memoirs by the Columbia University Press. In connection with the change to the Chicago Press it was further decided to economize a little by increasing the amount printed on a page of the Proceedings a trifle over 20% at the expense of the margins through increasing the width of the line by one ninth from 4.5 to 5 inches (27 to 30 picas) and the number of lines on the page by 4 from 43 to 47. In view of this, the free page allowance for articles by members was reduced from 12 pages to 10 and for those of non-members from 6 to 5.

In 1954 the trouble struck. By the end of the fiscal year, on June 30, the balance in the Proceedings Fund was in the red at −$300; the expenses of the fiscal year had been about $18,000 above the budget of about $7000. The cost of $25,000 was not unreasonable. The increase in printing prices and in the size of the volume had added considerably to the statement in my Annual Report of 1953 in which I said that the cost of volume 38 was in excess of $20,000. President Bronk, Treasurer Robbins and the Council simply took the Proceedings off a budget and left the Editorial Board and the Managing Editor free to continue to print promptly the papers the members communicated. That is indeed the only way one can operate a journal of which the administration has no control over the amount published; we must have been forced to it earlier had not the amount gone down so far for so long due to the war. In my warnings about the situation from 1947 on, I had been premature, for I had expected the recovery in the demand for space in the Proceedings to come much more promptly than it had. That was the precedent of the previous war; if the recovery then had been

as slow as recently, the Proceedings might not have been in so difficult a situation in 1920.

By the time that volume 40 (1954) was completed it had run to 1176 pages against the previous volume's 1310, but because there was more on a page, the "equivalent" number of pages was 20% greater and came to 1412, which was 8% greater and made the volume the largest to that time. And something had to be done about costs. The Business Manager, Mr. Meid, Mr. Campbell of the staff, and the Managing Editor did a great deal of work on what might be done to meet the cost of printing without imposing unbearable burden upon the members of the Academy, the authors, or the general funds of the Academy. By this time (July 1955) Wendell Stanley succeeded Linus Pauling as Chairman of the Editorial Board. He was very helpful with suggestions and patient with the great amount of detail that was collected primarily by Mr. Campbell, and he made a clear and convincing exposition of the plan to the Academy, which was sympathetically received by the Academy, adopted by the Council, and promptly circulated to all members of the Academy effective for all manuscripts received after January 1, 1956. Mr. Campbell did not remain to see his plan in action, but Mrs. Williams who had worked with him upon it took over the work in his place and has stayed with the Proceedings to this day.

The plan was this. After the studies of the costs of different contributions had been digested it had become clear that different kinds of contributions cost very different sums per page. Plain text in English was cheapest, mathematical or chemical display formulas were much more expensive, and so were detailed ruled tables, and rewriting one's article in proof cost money. On the other hand some formulas could say a great deal in a relatively small amount of space, and so could a table, while some subjects required a good deal of descriptive explanation in plain text. It was therefore decided that the most equitable thing was to put the allowance, not on pages, but in dollars. The initial allowance was $200 for such articles as any one member communicated within a calendar year. It was thought that this would cover all costs of the Academy for publishing an article in plain text not over 8 pages long. After this plan had been adopted I remembered that years before, when the question of a page allowance came up, that very wise man Ross Harrison who had served on the Editorial Board had recommended such a plan for the very same reasons, but it was rejected because of fears of its complications in application. Well, the Chicago Press did feel it so difficult to operate that we had to bring the Proceedings back to the Academy. Our printing company seems to find no difficulty in furnishing us the necessary information to make it operable. The Council of the Academy assumed a very great maximum liability for the Academy in accepting this plan; for if there had been a very large increase in the average contributions per member without a corresponding increase in subscriptions the burden on the Academy would have been unbearable.

This brings this History to the last nine years. The statistical data are given in more detail than previously; instead of following the original 10 main divisions, it seems better to go over to the present situation in which there are 14 sections and Genetics, which though not a science recognized in the name of any section is still permitted since it still maintains its position as one of the first three in activity. Mathematics has lost its first place to an extraordinary explosion in biochemistry which in the two last years (1962–3) has had almost 45% of all the articles and brings out the same cries of overspecialization and overprofessionalization of the journal as were heard against mathematics when it was running over 40% of all articles. There are under present rules three ways for the members to remedy the situation they do not like: First, the critics could take pains to see that the Proceedings gets articles they like; second, the biochemists could take pains to make their articles more appealing to members in other sections; third, members not in the section of biochemistry when they communicate an article could urge its classification in their own section or some other than biochemistry such as chemistry, genetics, physiology, or microbiology. In a recent issue more than half of all the articles classified as biochemistry were communicated by members in some other section.

As the sections of the Academy are of various sizes, it is not to be expected that the number of articles in the Proceedings should be the same for different sections. For this reason I have added in Table 4 two lines not used before. First is the number of members of the Academy in the median year of the nine (1959). This is not the average number during the nine-year period, but representative of it closely enough. And second I have entered the rate of communication of articles so classified even if not communicated by a member of that section. In this series biochemistry is still first, mathematics second, and genetics third. But just look at the four sections Anthropology, Psychology, Engineering, and Geology which have not averaged so much as one article per member during the whole period, and Astronomy is the next lowest at 1.2. Those subjects all have a great deal of interest for many of the members of the Academy and lend themselves readily to exposition for the general membership of the Academy. It may well be that the members of these five sections have ample publication facilities preferable to the Proceedings for their use. There is a good deal of evidence that the large use of the Proceedings for mathematics over its entire history has been accompanied by a high degree of activity in mathematical research and an insufficiency of facilities for its publication. The sharp drop in physics in our pages came at a time when far better facilities were provided for publication of physical research. It may be that the pressure on the Proceedings today to publish biochemical papers is due not only to great research activity in that field but to a serious lag in professional journals to take care of its publication.

TABLE 4

Distribution of the Sciences over Fifteen Main Divisions, 1955–1963

Description of the Table. The columns contain for each of the nine years the Year, the Volume, and the number of articles classified in each of the sciences, Mathematics, Astronomy, Physics, Engineering, Chemistry, Geology, Geophysics, in the Physical Sciences and their subtotal. Botany, Zoology, Genetics, Physiology, Biochemistry, Pathology and Microbiology, Anthropology, Psychology, in the Biological Sciences and their subtotal, followed by the Grand Total with the percentage thereof in the Biosciences. At the bottom are the totals for the 9-year period and the percentages that they are of the Grand Total. Below that is the number of members of the Academy in each of the fourteen sections in the mid-year of the nine (1959) with the numbers in Botany and Zoology added in parenthesis in the column for Genetics. The final row gives the rate of articles per sectional member for the 9-year period.

		Physical Sciences								Biological Sciences											
Section name and no.		Math. 1	As-tron. 2	Phys. 3	Eng. 4	Chem. 5	Geol. 6	Geo-phys. 13	*Sub Total*	Bot. 7	Zool. 8	Genet.	Phys-iol. 9	Bio-chem. 14	Pathol. Microb. 10	An-thro. 11	Psych. 12	*Sub Total*	Grand Total	% Bio.	Total Pages
Yr.	Vol.																				
55	41	78	7	9	4	13	2	11	*124*	7	11	31	2	31	3	0	0	*85*	209	40.7	1120
56	42	83	5	13	2	11	2	1	*117*	5	8	23	4	31	3	0	4	*78*	195	40.0	974
57	43	44	0	11	0	16	1	13	*85*	10	10	32	3	36	4	0	3	*98*	183	53.5	1087
58	44	35	4	14	0	13	0	2	*68*	10	6	23	10	75	12	0	3	*139*	207	67.1	1298
59	45	51	1	20	1	21	0	18	*112*	8	5	38	18	60	23	4	2	*158*	270	58.5	1823
60	46	40	7	23	1	11	0	3	*85*	5	7	39	9	77	14	1	1	*153*	238	64.0	1688
61	47	41	4	17	16	20	2	5	*105*	7	7	34	12	113	14	5	1	*193*	298	64.8	2040
62	48	42	2	15	5	24	5	4	*97*	6	8	53	12	147	27	0	1	*254*	351	72.4	2225
63	49–50	45	6	13	1	16	3	1	*85*	7	11	52	17	146	28	1	4	*266*	351	75.8	2174
Total		459	36	135	30	145	15	58	*878*	65	73	325	87	716	128	11	19	*1424*	2302	61.9	
Per cent		20.0	1.6	5.9	1.3	6.3	0.7	2.5	38.1	2.7	3.2	(4.2)	3.8	31.1	5.6	0.5	0.8	61.9	100		
Membership		34	30	86	45	89	35	29	348	43	53	(96)	33	46	41	12	23	251	599		
Rate		13.5	1.2	1.6	0.7	1.6	0.4	2.0	2.5	1.5	1.4	(3.4)	2.6	15.6	3.1	1.1	0.8	5.7	3.8		

There have always been articles difficult to classify in any section or even as science in the sense of the Academy. In the first Announcement it was provided that the Proceedings would contain a variety of statements on activities of the Academy, and it has been reported that this part of the Announcement had been given up after 1920 to conserve all available income for publishing research findings. There did not seem to be a way to classify sectionally under any recognized science President Bronk's excellent Symposium on Science in Education in volume 43 (1957), 621–648, with its distinguished speakers Corner, Moe, Adams, Faust, and Hildebrand. In contradistinction to what appeared in the same volume, pages 1–104, on geophysics, no titles were given for any of the five contributions on science in education. This and occasional other topics have simply been carried in the Contents under the general classification National Academy of Sciences and are not included in the statistical tables. This is the case with the Centennial Symposium with which volume 50 closes.

After this extended comment on Table 4, there remain but a few points to mention in bringing the History to a close.

By 1955, the distribution of the Proceedings had shrunk one way or another to a total of 1625 copies divided as follows: Complimentary and exchange, 59; members of the Academy, 580; domestic subscriptions, 588; foreign subscriptions, 398—figures considerably lower than those given above (p. 29) as of December 31, 1950.

Volume 45(1959) ran to 1823 pages—a jump of 40% from its predecessor—with 270 articles of average length 6.6 pages. In 1960 Saunders Mac Lane succeeded Wendell Stanley as Chairman of the Editorial Board. The volume of that year dropped back a bit from its predecessor and the average page length went up to 7.0. Originally all articles were limited to 6 of the old pages, equivalent to 5 of the new ones, and the average length of articles was only 3.5 of such pages.

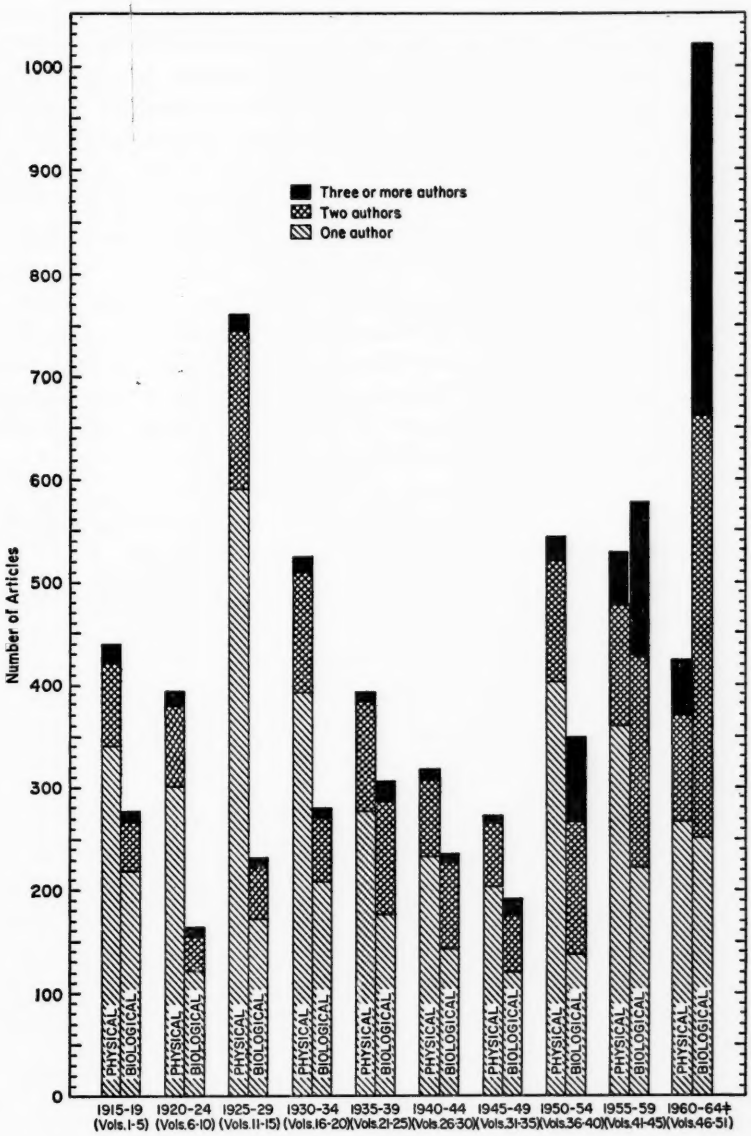
During 1961 there was an increase in the members' annual publishing allowance from $200 to $300, owing to rise of prices, and the rule was adopted that no single communicated article should exceed 8 printed pages in length, supplemented by the restriction that the name of no single author could appear on articles whose total length exceeded 8 pages in any one issue, though there was no restriction on the total number of pages a member could communicate by different authors. The 8-page limit on single articles, like the old 6-page limit of earlier days, has created difficulties for the authors and the editorial office alike; for it is very difficult to estimate accurately from a manuscript how many pages it will set, especially if there are display formulas, or other compositional difficulties on which the typesetters have to use their own discretion in the amount of lead they should use.

Volume 47 (1961) resumed the advance to 2080 pages, as can be seen from Table 4, and as volumes of 2000 pages are difficult to handle, it was decided in 1962 that come 1963 there should be two volumes a year. When

NUMBERS OF ARTICLES IN THE PROCEEDINGS, 1915–1964

DIVIDED ACCORDING TO THE PHYSICAL* AND BIOLOGICAL† SCIENCES

SHOWING NUMBER OF AUTHORS PER ARTICLE



* Physics, chemistry, mineralogy, petrology, geology, astronomy, meteorology, geophysics, engineering, statistics, and mathematics.

† Zoology, botany, physiology, morphology, genetics, bacteriology, pathology, microbiology, biochemistry, psychology, and anthropology.

‡ Through June of 1964.

1962 was over, this decision was amply confirmed by finding that volume 48 had run to 2225 pages. The two volumes of 1963 between them contain 2174. And one may add that volume 51 for the first half of 1964 has run to 1318.

In connection with this great increase in the size of the Proceedings during the past nine years it should be mentioned that the number of articles by members has not increased despite an increase in the membership of the Academy from 528 to 673, and that the proportion of articles by members, which in 1952 was stated (p. 29) to have remained just under 40%, had by 1963 dropped to 26%. Another change which has been taking place is a great increase in multiple authorship. The chart prepared by Mrs. Williams to indicate this and other data is given in the foregoing figure (p. 37).

The figures on distribution at the end of 1963 are: 3345 copies under paid subscriptions plus 902 copies under gratis distribution including 739 copies to members of the Academy, Foreign Associates, and Members Emeriti. And in view of the large amount of loss on the Proceedings in some past years it is good to note that by mid-1964 the two volumes produced during 1963 were in the black by approximately $6000 despite an expenditure of some $1000 in the printing of Centennial articles in 1963.

POSSIBILITIES FOR THE FUTURE

I may state here what I emphasized in my statement to the new Editorial Board in 1951. What I personally feel that the policy of the Proceedings should be has been no part of my business as Managing Editor and, per contra, has been assigned to the Editorial Board in general and to its Chairman in particular to recommend to the Council of the Academy, and for the Council to decide. The duty of the Managing Editor is to see that the Proceedings conforms to those decisions.

The Proceedings today is not what George Hale wanted it to be in his proposal for it and what it largely was so long as his influence and the influence of those associated with him lasted. Thucydides wrote his History "for those who desire an exact knowledge of the past as a key to the future, which in all probability will repeat or resemble the past." It may well be that history is more interesting as story than it can be as precedent except in a very general way in showing how man acts, changeable or unchanging as he is.

Let me recall Hale's intention. He wrote: "The great area over which our members are distributed and the lack of any such centralization as we see in London or in Paris will always stand in the way of weekly meetings like those of the Royal Society and the Paris Academy .... The disadvantage of our members in being unable to read accounts of their latest advances before weekly meetings of their colleagues can be largely offset by the pub-

lication of Proceedings, in which the first results of all new work may be adequately presented. Thus, though we lack some of the advantages of centralization, these may be largely overcome, while retaining the very great advantage of a widely scattered membership representing the scientific interests of every section of the country."

This was one reason for the rule that the contributions should be short—they were primarily for one another—and for its corollaries that they should be accepted on the scientific authority of the communicating member, should be preliminary to professional publication and probably accumulate toward it. When the permissive length of communications of their own work by members was doubled in 1951, thus introducing competition with professional journals, it would have been my personal preference that a referee system analogous to that of the Royal Society, and like that originally suggested by the Committee on the Publication of the Proceedings (p. 6), be instituted for all the longer articles, despite the inevitable delay in their publication. If the Proceedings is to compete with professional journals, it should for its own safety compete on as rigorous terms.

When the Proceedings was started, the Academy had a series of Scientific Memoirs in which scientists could publish their work at length. That series appears to have been dropped although provision for it remains in the By-laws of the Academy and in the laws of the United States Government. At that time the American Academy of Arts and Sciences in Boston had not only octavo Proceedings which were available for some long monographs, but also quarto Memoirs for even longer works. Both series have lapsed, and only Daedalus remains. The corresponding two series still remain in the publications of the American Philosophical Society in Philadelphia. Since the Proceedings was established, there has been a great expansion in the opportunities for prompt publication of brief articles, as in Science or in Letters to the Editor in a number of professional journals and even in the popular press where one may find notices sometimes all too preliminary. It may well be that the needs of the members for opportunities to publish have changed and that with the increasing intensity of specialization their interest in one another's work has diminished. Indeed if my recent observations at our Annual Meetings have been a fair sample, I should conclude that the scientific sessions in which members communicate their newest findings are poorly attended in the little Lecture Room, while the symposia in the Great Hall are crowded with listeners to talks sometimes not on new scientific research at all. There is an old proverb about a cobbler sticking to his last, and another about the cobbler's children not having shoes.

The recent persistent decrease in the proportion of papers by members may well raise the question whether something should be done to counter it. I have quoted (p. 28) the two sections of the Constitution which specify the privileges of members in respect to the papers they may read

at meetings. The permission for nonmembers is decidedly more restricted; as stated in Bylaw V.1 it reads:

"Persons who are not members may read papers in scientific sessions of the Academy on invitation of the Council or of the committee on arrangements, or on recommendation by an Academy member and approval by the committee on arrangements."

Should a corresponding rule be applied to papers communicated by members for nonmembers, it could end with *"and approval by the Editorial Board."* (I doubt if this restriction need apply to really short papers, say under four pages, like those of the first six volumes.) Or one could renew a space differential in favor of members like that of 1952 (p. 31), dropped in 1956.

In this History the attention has been chiefly upon the relations of the members to the Proceedings, which has always been the province of the Editorial Board. The original Announcement (p. 7) provided for items, other than communications by members, which would come through administrative officers, such as reports by the Home Secretary on the Annual and Autumn Meetings or symposia (pp. 15–16) designed to block out needed research in critical areas of science. After the reorganization of 1920 such materials did not appear for a long time. In 1949 there was the report (*35*, 547–575) of the Academy's Conference on Bioelectric Potentials, and there have been ever since a series of conference reports or symposia culminating in the four Centennial Symposia of 1963 printed in volumes 50, 51, and 52. Such special lectures are supposed to be within 10 pages unless there are compelling reasons for more space, and the Academy, not the contributors, carries the cost of publication.

With the obvious balkanization of science into smaller and smaller specialist domains with their mutually unintelligible specialist jargons, it is but natural that the past ten volumes of the Proceedings should be as different as they are from the first ten, and it is not unlikely that the next fifty years will see even greater changes—it may even be probable that they *should*. Science is almost always both provisional and approximate. It is only pure mathematics and theology which are purely postulational and perfect. In the days when there was much talk of President Franklin Roosevelt's Four Freedoms, I heard a very distinguished member of the Academy say that he was not worried so much about them, what he wanted was freedom from new facts—they were so disturbing to nice old theories! There is no reason but inertia why the Proceedings should not change in the future as it has in the past; its policies and practices are entirely in the hands of the Council of the Academy.

Index to Authors
Volumes 1–50 (1915–1963)

Note on the Organization of Index Entries

Each volume of the *Proceedings* has contained a combined subject and author index as well as a volume table of contents in which articles have been grouped according to the scientific classification under which they have been published. As has been mentioned in the foregoing History, these classifications have been the fields of science that are named in the titles of the Sections of the Academy, plus Genetics.

The following is a cumulative index to the authors of articles published in volumes 1–50 (1915–1964). It lists the names of all authors alphabetically, each name followed by the title of each article, with volume number (in boldface type), initial page number, and year of publication. For each author, or each group of collaborating authors, the articles are arranged chronologically. In cases of joint authorship, the title of an article is given only under the first-named author; a cross-reference to this author's name, and including volume, page number, and year, is given under the name of each other author. When an author is represented in this index by two or more articles of which he is the sole or first-named author, his name after the first entry under it is replaced by a long dash.

A

ABBOT, C. G., F. E. FOWLE, and L. B. ALDRICH. Confirmatory Experiments on the Value of the Solar Constant of Radiation, **1**, 331 (1915)

—— and L. B. ALDRICH. The Pyranometer: An Instrument for Measuring Sky Radiation, **2**, 333 (1916)

——. Terrestrial Temperature and Atmospheric Absorption, **4**, 104 (1918)

——. The Smithsonian "Solar Constant" Expedition to Calama, Chile, **4**, 313 (1918)

——. Recent Simultaneous Measurements of the Solar Constant of Radiation at Mount Wilson, California, and Calama, Chile, **5**, 383 (1919)

——. Rotating Projectiles from Smooth-Bore Guns, **5**, 386 (1919)

——. Means of Measuring the Speed of Projectiles in Flight, **5**, 388 (1919)

——. A New Method of Determining the Solar Constant of Radiation, **6**, 4 (1920)

——. The Larger Opportunities for Research on the Relations of Solar and Terrestrial Radiation, **6**, 82 (1920)

——. New Observations on the Variability of the Sun, **6**, 674 (1920)

——, F. E. FOWLE, and L. B. ALDRICH. The Larger Results of 20 Years of Solar Radiation Observations, **8**, 177 (1922)

—— and COLLEAGUES. The Solar Prelude of an Unusual Winter, **9**, 194 (1923)

——. Preliminary Note. On the Variations of the Sun's Visible Features Associated with Variations of Solar Radiation, **9**, 355 (1923)

—— and A. M. BOND. Symposium on Climatic Cycles: Periodicity in Solar Variation, **19**, 361 (1933)

ABBOT, H. L. Hydrology of the Isthmus of Panama, **3**, 41 (1917)

ABBOT, L. H. *See* Abbot, C. G., **9**, 194 (1923)

ABBOTT, J. *See* Holtzer, H., **46**, 1533 (1960)

ABBOTT, M. T. *See* Warner, R. C., **49**, 533 (1963)

ABEL, J. J., and M. C. PINCOFFS. On the Presence of Albumoses in Extracts of the Posterior Lobe of the Hypophysis Cerebri, **3**, 507 (1917)

——. Crystalline Insulin, **12**, 132 (1926)

ABELLO, T. P. Absorption of Ultra-Sonic Waves by Hydrogen and Carbon Dioxide, **13**, 699 (1927)

ABELSON, P. H., E. T. BOLTON, R. J. BRITTEN, D. B. COWIE, and R. B. ROBERTS. Synthesis of the Aspartic and Glutamic Families of Amino Acids in *Escherichia coli*, **39**, 1020 (1953)

——. Extra-Terrestrial Life, **47**, 575 (1961)

—— and T. C. HOERING. Carbon Isotope Fractionation in Formation of Amino Acids by Photosynthetic Organisms, **47**, 623 (1961)

——. *See* Cook, S. F., **23**, 528 (1937); Roberts, R. B., **39**, 1013 (1953); Cloud, P. E., Jr., **47**, 1705 (1961)

ABHYANKAR, S., and O. ZARISKI. Splitting of Valuations in Extensions of Local Domains, **41**, 84 (1955)

——. Splitting of Valuations in Extensions of Local Domain, II. **41**, 220 (1955)

ABORN, R. H. *See* Clark, G. L., **13**, 549 (1927)

ABRAMOWITZ, A. A. Degeneration of Xanthophores in *Fundulus majalis*, **21**, 132 (1935)

——. Regeneration of Chromatophore Nerves, **21**, 137 (1935)

——. Color Changes in Cancroid Crabs of Bermuda, **21**, 677 (1935)

——. The Double Innervation of Caudal Melanophores in *Fundulus*, **22**, 233 (1936)

——. The Action of Intermedin on Crustacean Melanophores and of the Crustacean Hormone on Elasmobranch Melanophores, **22**, 521 (1936)

ABRAMOWITZ, M. *See* Steinberg, A. G., **24**, 107 (1938)

ACCASCINA, F., E. L. SWARTS, P. L. MERCIER, and C. A. KRAUS. The Conductance of Solutions of Salts in Orthodichlorobenzene, **39**, 917 (1953)

——, R. L. KAY, and C. A. KRAUS. The Fuoss-Onsager Conductance Equation at High Concentrations, **45**, 804 (1959)

——. *See* Fuoss, R. M., **45**, 1383 (1959)

ACCOLA, R. D. M. Differentials and Extremal Length on Riemann Surfaces, **46**, 540 (1960)

ACKER, R. F. *See* Kochi, M., **38**, 383 (1952)

ACKERMAN, J. W. *See* Bancroft, W. D.: **17**, 407, 480 (1931), **18**, 147 (1932)

ACKERMAN, P. H., and F. L. BLACK. A Radiobiological Analogy between Measles Virus and Temperate Phages, **47**, 213 (1961)

Acs, G. *See* Weiss, S. B., **44,** 189 (1958); Zachau, H. G., **44,** 885 (1958)

Adams, A. S. Symposium on Science in Education, **43,** 635 (1957)

Adams, F. D., and W. J. Dick. The Extension of the Montana Phosphate Deposits Northward into Canada, **2,** 62 (1916)

Adams, J. A. S., M.-C. Kline, K. A. Richardson, and J. J. W. Rogers. The Conway Granite of New Hampshire as a Major Low-Grade Thorium Resource, **48,** 1898 (1962)

Adams, J. F. On the Cobar Construction, **42,** 409 (1956)

Adams, J. M. *See* Imagawa, D. T., **46,** 1119 (1960)

Adams, J. N., and S. E. Luria. Transduction by Bacteriophage P1: Abnormal Phage Function of the Transducing Particles, **44,** 590 (1958)

Adams, L. H., and R. E. Gibson. The Compressibilities of Dunite and of Basalt Glass and Their Bearing on the Composition of the Earth, **12,** 276 (1926)

—— and R. E. Gibson. The Elastic Properties of Certain Basic Rocks and of Their Constituent Minerals, **15,** 713 (1929)

—— and B. L. Davis. Rapidly Running Transitions at High Pressure, **48,** 982 (1962)

Adams, R. On Non-Factorable Transformations of Double Sequences, **19,** 564 (1933)

Adams, W. S., and C. G. Burwell. Results of an Investigation of the Flash Spectrum without an Eclipse—Region λ 4800 to λ 6600, **1,** 127 (1915)

—— and F. G. Pease. Nova Geminorum No. 2 as a Wolf-Rayet Star, **1,** 391 (1915)

——. The Radial Velocities of the More Distant Stars, **1,** 417 (1915)

—— and H. Shapley. The Spectrum of δ Cephei, **2,** 136 (1916)

——. Investigations in Stellar Spectroscopy. I. A Quantitative Method of Classifying Stellar Spectra, **2,** 143 (1916)

——. Investigations in Stellar Spectroscopy. II. A Spectroscopic Method of Determining Stellar Parallaxes, **2,** 147 (1916)

——. Investigations in Stellar Spectroscopy. III. Application of Spectroscopic Method of Determining Stellar Distances to Stars of Measured Parallax, **2,** 152 (1916)

——. Investigations in Stellar Spectroscopy. IV. Spectroscopic Evidence for the Existence of Two Classes of M Type Stars, **2,** 157 (1916)

—— and A. H. Joy. Some Spectral Characteristics of Cepheid Variables, **4,** 129 (1918)

——. The Absorption Spectrum of the Novae, **4,** 355 (1918)

—— and G. Strömberg. On the Use of the Spectroscopic Method for Determining the Parallaxes of the Brighter Stars, **5,** 228 (1919)

—— and A. H. Joy. The Motions in Space of Some Stars of High Radial Velocity, **5,** 239 (1919)

—— and A. H. Joy. A Method of Deriving the Distance of the A-Type Stars, **8,** 173 (1922)

——. The Relativity Displacement of the Spectral Lines in the Companion of Sirius, **11,** 382 (1925)

—— and A. H. Joy. The Relationship of Spectral Type to Period among Variable Stars, **13,** 391 (1927)

—— and A. H. Joy. High-Dispersion Stellar Spectra and Some Results of a Study of γ Cygni, **13,** 393 (1927)

—— and S. B. Nicholson. Symposium on Climatic Cycles: Nature of the Solar Cycle, **19,** 371 (1933)

——. *See* Kapteyn, J. C., **1,** 14 (1915); St. John, C. E., **10,** 392 (1924)

Addis, T. The Mechanism of Proteinuria, **35,** 194 (1949)

Adelberg, E. A. *See* Myers, J. W., **40,** 493 (1954)

Adelson, D. E., and M. T. Bogert. The Synthesis of Gamma-Methyl-5, 6-Cyclopenteno-Retene, A Compound Structurally Related to "Diels' Hydrocarbon," **23,** 117 (1937)

Adem, J. The Iteration of the Steenrod Squares in Algebraic Topology, **38,** 720 (1952)

——. Relations on Iterated Reduced Powers, **39,** 636 (1953)

Adhya, S. *See* Echols, H., **50,** 286 (1963)

Adler, J., I. R. Lehman, M. J. Bessman, E. S. Simms, and A. Kornberg. Enzymatic Synthesis of Deoxyribonucleic Acid. IV. Linkage of Single Deoxynucleotides to the Deoxynucleoside Ends of Deoxyribonucleic Acid, **44,** 641 (1958)

——. *See* Bessman, M. J., **44,** 633 (1958); Lehman, I. R., **44,** 1191(1958)

Adler, L. *See* MacInnes, D. A., **5,** 160 (1919)

Adye, J. *See* Koffler, H., **43,** 464 (1957)

AEBERSOLD, P. C. *See* Zirkle, R. E., **22,** 134 (1936); Lawrence, J. H., **22,** 543 (1936); Snell, G. D., **23,** 374 (1937)

AGNEW, R. P. Global Versions of the Central Limit Theorem, **40,** 800 (1954)

AHLFORS, L. V. Square-Integrable Differentials on Open Riemann Surfaces, **42,** 758 (1956)

AISENBERG, A. C. *See* Heidelberger, M., **39,** 453 (1953)

AISSEN, M., A. EDREI, I. J. SCHOENBERG, and A. WHITNEY. On the Generating Functions of Totally Positive Sequences, **37,** 303 (1951)

AITKEN, R. G. A Statistical Study of the Visual Double Stars in the Northern Sky, **1,** 530 (1915)

AIZAWA, Y. *See* Mueller, G. C., **47,** 164 (1961)

AJL, S. J., and C. H. WERKMAN. Enzymatic Fixation of Carbon Dioxide in α-Ketoglutaric Acid, **34,** 491 (1948)

ALAOGLU, L., and G. BIRKHOFF. General Erogodic Theorems, **25,** 628 (1939)

ALBERS, R. W., S. FAHN, and G. J. KOVAL. The Role of Sodium Ions in the Activation of Electrophorus Electric Organ Adenosine Triphosphatase, **50,** 474 (1963)

ALBERT, A. A. Normal Division Algebras Satisfying Mild Assumptions, **14,** 904 (1928)

——. The Group of the Rank Equation of Any Normal Division Algebra, **14,** 906 (1928)

——. The Rank Function of Any Simple Algebra, **15,** 372 (1929)

——. On the Structure of Pure Riemann Matrices with Non-Commutative Multiplication Algebras, **16,** 308 (1930)

——. On Direct Products, Cyclic Division Algebras, and Pure Riemann Matrices, **16,** 313 (1930)

——. Normal Division Algebras of Order 2^{2m}, **17,** 389 (1931)

——. Involutorial Simple Algebras and Real Riemann Matrices, **20,** 676 (1934)

——. The Matrices of Factor Analysis, **30,** 90 (1944)

——. The Minimum Rank of a Correlation Matrix, **30** 144 (1944)

——. A Theory of Trace-Admissible Algebras, **35,** 317 (1949)

——. A Note on the Exceptional Jordan Algebra, **36,** 372 (1950)

——. On Involutorial Algebras, **41,** 480 (1955)

——. On Hermitian Operators over the Cayley Algebra, **41,** 639 (1955)

——. A Property of Special Jordan Algebras, **42,** 624 (1956)

——. The Norm Form of a Rational Division Algebra, **43,** 506 (1957)

——. On the Nuclei of a Simple Jordan Algebra, **50,** 446 (1963)

ALBERTS, B. M. *See* Fresco, J. R., **46,** 311 (1960)

ALBERTY, R. A., and R. M. Bock. Alteration of the Kinetic Properties of an Enzyme by the Binding of Buffer, Inhibitor, or Substrate, **39,** 895 (1953)

ALBRECHT, R. *See* Dalldorf, G., **41,** 978 (1955)

ALDRICH, F. L. *See* Balls, A. K., **41,** 190 (1955)

ALDRICH, L. B. *See* Abbot, C. G.: **1,** 331 (1915), **2,** 333 (1916), **8,** 177 (1922), **9,** 194 (1923)

ALEEM, M. I. H., and A. NASON. Phosphorylation Coupled to Nitrite Oxidation by Particles from the Chemoautotroph, *Nitrobacter agilis*, **46,** 763 (1960)

ALEXANDER, I. E., and T. F. O'BRIEN, JR. High-Tone Stimulation and Hearing Loss, **40,** 848 (1954)

ALEXANDER, J. W. A Lemma on Systems of Knotted Curves, **9,** 93 (1923)

——. On the Deformation of an n-Cell, **9,** 406 (1923)

——. On the Subdivision of 3-Space by a Polyhedron, **10,** 6 (1924)

——. An Example of a Simply Connected Surface Bounding a Region Which Is Not Simply Connected, **10,** 8 (1924)

——. Remarks on a Point Set Constructed by Antoine, **10,** 10 (1924)

——. New Topological Invariants Expressible as Tensors, **10,** 99 (1924)

——. On Certain New Topological Invariants of a Manifold, **10,** 101 (1924)

——. Topological Invariants of Manifolds, **10,** 493 (1924)

——. On the Intersection Invariants of a Manifold, **11,** 143 (1925)

——. Note on a Theorem by H. Kneser, **11,** 250 (1925)

——. A Matrix Knot Invariant, **19,** 272 (1933)

——. Note on Pontrjagin's Topological Theorem of Duality, **21,** 222 (1935)

——. On the Chains of a Complex and Their Duals, **21,** 509 (1935)

——. On the Ring of a Compact Metric Space, **21**, 511 (1935)

——. On the Connectivity Ring of a Bicompact Space, **22**, 300 (1936)

——. On the Connectivity Ring of a Bicompact Space (Second Note), **22**, 381 (1936)

——. On the Concept of a Topological Space, **25**, 52 (1939)

——. On the Connectivity Ring of a Lattice, **25**, 208 (1939)

——. Ordered Sets, Complexes, and the Problem of Compactification, **25**, 296 (1939)

ALEXANDER, M., and P. W. WILSON. Enzyme Localization in *Azotobacter vinelandii*, **41**, 843 (1955)

——. *See* Hurwitz, J., **48**, 1222 (1962)

ALEXANDER, M. L., and W. S. STONE. Radiation Damage in the Developing Germ Cells of *Drosophila virilis*, **41**, 1046 (1955)

——. Biological Damage in Developing Germ Cells of *Drosophila virilis* in Oxygen and Nitrogen with 14-mev Neutrons, **44**, 1217 (1958)

ALFERT, M., and H. A. BERN. Hormonal Influence on Nuclear Synthesis. I. Estrogen and Uterine Gland Nuclei, **37**, 202 (1951)

—— and I. I. GESCHWIND. A Selective Staining Method for the Basic Proteins of Cell Nuclei, **39**, 992 (1953)

——. *See* Das, N. K., **47**, 1 (1961)

ALLARD, R. W. *See* Jain, S. K., **46**, 1371 (1960); Workman, P. L., **48**, 1318 (1962)

ALLEN, C. E. The Direct Results of Mendelian Segregation, **12**, 2 (1926)

——. A Diploid Female Gametophyte of *Sphaerocarpos*, **20**, 147 (1934)

ALLEN, E. *See* Schweet, R. S., **44**, 173, 1029 (1958)

ALLEN, E. T. Neglected Factors in the Development of Thermal Springs, **20**, 345 (1934)

ALLEN, L., JR., L. BEAVERS II, W. A. WHITAKER, J. A. WELCH, JR., and R. B. WALTON. Symposium on Scientific Effects of Artificially Introduced Radiations at High Altitudes: Project Jason Measurement of Trapped Electrons from a Nuclear Device by Sounding Rockets, **45**, 1171 (1959)

ALLEN, M. On Thermal Emission and Evaporation from Water, **10**, 88 (1924)

ALLEN, R. P. *See* Bancroft, W. D., **15**, 445 (1929)

ALLEN, T. H., and J. H. BODINE. Enzymes in Ontogenesis. XVI. Activation of Protyrosinase by Sodium Alkyl Sulfates, **27**, 269 (1941)

ALLER, L. H. *See* Liller, W., **49**, 675 (1963)

ALLFREY, V. G. Amino Acid Incorporation by Isolated Thymus Nuclei. I. The Role of Desoxyribonucleic Acid in Protein Synthesis, **40**, 881 (1954)

—— and A. E. MIRSKY. The Role of Deoxyribonucleic Acid and Other Polynucleotides in ATP Synthesis by Isolated Cell Nuclei, **43**, 589 (1957)

—— and A. E. MIRSKY. Some Aspects of Ribonucleic Acid Synthesis in Isolated Cell Nuclei, **43**, 821 (1957)

—— and A. E. MIRSKY. Some Effects of Substituting the Deoxyribonucleic Acid of Isolated Nuclei with Other Polyelectrolytes, **44**, 981 (1958)

—— and A. E. MIRSKY. Contrasts in the Metabolic Stability of Different Nucleotides in the Ribonucleic Acids of Isolated Nuclei, **45**, 1325 (1959)

——, R. MEUDT, J. W. HOPKINS, and A. E. MIRSKY. Sodium-Dependent "Transport" Reactions in the Cell Nucleus and Their Role in Protein and Nucleic Acid Synthesis, **47**, 907 (1961)

—— and A. E. MIRSKY. Evidence for the Complete DNA-Dependence of RNA Synthesis in Isolated Thymus Nuclei, **48**, 1590 (1962)

——, V. C. LITTAU, and A. E. MIRSKY. On the Role of Histones in Regulating Ribonucleic Acid Synthesis in the Cell Nucleus, **49**, 414 (1963)

——. *See* Frenster, J. H., **46**, 432 (1960); Sibatani, A., **48**, 471 (1962); Naora, Hiroto, **48**, 853 (1962); Davidson, E. H., **49**, 53 (1963); Izawa, M., **49**, 544 (1963); Izawa, M., **50**, 811 (1963); Frenster, J. H., **50**, 1026 (1963)

ALLING, N. L. A Characterization of Abelian η_α-Groups in Terms of Their Natural Valuation, **47**, 711 (1961)

ALLIS, E. P., JR. The Lips and the Nasal Apertures in the Gnathostome Fishes, and Their Homologues in the Higher Vertebrates, **3**, 73 (1917)

——. The Myodome and Trigemino-Facialis Chamber of Fishes and the Corresponding Cavities in Higher Vertebrates, **4**, 241 (1918)

ALLISON, S. K., and W. DUANE. Absorption Measurements of Certain Changes in the

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——. Automorphism Commutators, **15,** 672 (1929)
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——. Non-Abelian Groups Admitting More Than Half Inverse Correspondencies, **16,** 168 (1930)
——. Groups Generated by Two Given Groups, **16,** 305 (1930)
——. Group of Isomorphisms of an Abelian Group, **16,** 398 (1930)
——. Groups Which Are Decomposable into Two Non-Invariant Cyclic Subgroups, **16,** 527 (1930)
——. Groups Which Admit Five-Eighths Automorphisms, **17,** 39 (1931)
——. Inverse Commutator Subgroups, **17,** 144 (1931)
——. Automorphisms of Order 2 of an Abelian Group, **17,** 320 (1931)
——. Theorems Relating to the History of Mathematics, **17,** 463 (1931)
——. Groups Involving a Small Number of Conjugates, **17,** 691 (1931)
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——. Orders for Which There Exist Exactly Four or Five Groups, **18,** 511 (1932)
——. Non-Group Operations, **18,** 597 (1932)
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——. Minimum Number of Squares in a Group When Not All of Them Are Relatively Commutative, **20,** 127 (1934)
——. Groups Whose Squares Constitute Cyclic Subgroups, **20,** 203 (1934)
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——. Groups Which Contain Less Than Ten Proper Subgroups, **25,** 482 (1939)

——. Groups Which Contain Ten or Eleven Proper Subgroups, **25,** 540 (1939)

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——. Groups of Transformations of the Non-Invariant Subgroups, **29,** 240 (1943)
——. Special Invariant Subgroups, **29,** 308 (1943)
——. Subgroups Transformed According to a Group of Prime Order, **29,** 311 (1943)
——. Relative Number of Non-Invariant Operators in a Group, **30,** 25 (1944)
——. Possible Numbers of Non-Invariant Operators of a Group, **30,** 114 (1944)
——. Groups Containing Less Than Twenty-Eight Non-Invariant Operators, **30,** 275 (1944)
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——. Prime Number of Operators in Sets of Conjugates, **32,** 149 (1946)
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MOON, R. C. *See* Huggins, C., **48,** 379 (1962)

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